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TRANSACTIONS

OF THE

Thirty-seventh Annual Meeting

OF THE

American Laryngological Association

HELD AT

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NIAGARA FALLS, CANADA

JUNE 1ST, 2D AND 3D, 1915

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TRANSACTIONS

OF THE

American Laryngological Association

HELD AT

NIAGARA FALLS, CANADA, JUNE 1ST, 2D AND 3D, 1915

PRESIDENT'S ADDRESS

BY ALEXANDER W. MAC COY, M. D.

Fellows of the American Laryngological Association:

From the beginning—thirty-six years ago—the institution of an annual address by the president has been in full effect. So far as I can learn, no man has "escaped." During these thirty odd years this Association has had the gracious privilege of hearing, digesting and criticising the productions offered.

Reverting to the records preserved in our "Transactions," the annual address has been given first place by the printer. Aside from the typesetter's preference the transactions show splendid performances of all the worthy fellows who have preceded us. We can but feel that whatever is today offered will be but a meager product in contrast to the erudite and splendid efforts which have already been given. Most of our scientific papers offered in earlier studies before the birth of the "Transactions" are found in the volumes of the archives of laryngology (during 1880-1-2-3). These four volumes make a splendid exhibit of the work of our forebears. Lest we forgot, or faltered on our way, it has been the habit to give space to *living* questions of interest to our Association and to present the highest ideals for attainment. Our enthusiasm has been re-kindled. Our hearts and minds have been stirred with earnest purposes to do and live worthily of our rich heritage.

Having then such valued and available records so conveniently at hand, and best of all, still having our Nestor and Mentor with us to restrain and admonish, it has been thought safe and sane to turn aside for a short space of time from this well established custom in order to touch the human, or personal, side of a few of our founders and early workers in the art and science of laryngology.

Naturally (for these remarks are chiefly *personal reminiscences*) we come to speak (first) of our fellows in Philadelphia. These reminiscences date from our student days at the university in medicine, and later on when we ourselves became interested in laryngology and rhinology in 1882. While we were students we soon heard of a young man at the Jefferson Medical College said to be specializing in the diseases of the larynx. We understood he was viewed with suspicion by some of his colleagues, and his place in ethical practice was held sub judice. This young man was Dr. J. Solis Cohen, our honored Nestor, whom today we acclaim our "past grand master" in laryngology. When appointed to lecture on diseases of the throat at Jefferson, at his first lecture he was introduced by a most distinguished surgeon of his time "as a gentleman who was specializing a cubic inch of the body" and the speaker had no doubt some one would soon be "specializing the umbilicus." On our return to Philadelphia nine years later Dr. Cohen was *"facile princeps"* in the field of his choice. His reputation extended near and far, and his advice was sought by many. To illustrate, from New Jersey (for Jersey had heard of Dr. Cohen too) there came a woman who had not only caused no end of gossip in her neighborhood at home, but had been of great interest to her physicians likewise, because she had swallowed a lizard. Various remedies had been tried in the laudable effort to eject the reptile. Emetics, purges and surgical interferences were brought to bear on the miserable and unfortunate victim,—all to no purpose. The history of having swallowed a lizard was clear and vouched for by a practitioner who, more skilled than others, had seen the lizard's head, and had made strenuous but futile attempts to remove it by seizing its head with rat-tooth forceps.

A laryngeal mirror in the hand of Dr. Cohen revealed not a

lizard's head, gentlemen, but a badly lacerated and swollen epiglottis! What greater luck could any man wish for than to have such a notorious case for his promotion? (Is it any wonder, gentlemen, that Dr. Cohen's reputation grew and grew like a green bay tree until its great shadows blessed the earth?)

At an early date the Philadelphia Laryngological Society was founded. This little band of workers met monthly at our various offices. Many interesting papers were offered. Discussions were valuable. Some were printed in the Archives of Laryngology.

In 1882 we were honored by the presence of a distinguished guest, Dr. Morrel Mackenzie, of London. He was the guest of Dr. Cohen while in Philadelphia. We were impressed with the mutual respect the two men had for each other. The Philadelphia Laryngological Society gave Dr. Mackenzie a banquet at the old Bellevue. Some 15 or 20 guests were present. Dr. Louis Elsberg was one of the number. Our menu cards were painted by hand by our distinguished and versatile member, Dr. Charles M. Sajous,—and were appreciated so much by Dr. Mackenzie that he took his card home to London and had it framed and hung in his office. Through the courtesy of Dr. Sajous I brought one of the cards as an exhibit.

An anecdote current then on Dr. Mackenzie is as follows: One day in London while Dr. Mackenzie was busily engaged with his enormous practice, he received an urgent message from his friend Whistler, the artist, to come to his home and see an urgent throat case. Dr. Mackenzie demurred and said he could not possibly desert his office while so many were waiting to consult him. After great insistence on the part of Whistler and a promise to pay whatever fee was demanded, Dr. Mackenzie went to Whistler's residence and was shown at once to the chamber of the patient. To his infinite surprise and disgust his patient proved to be Whistler's "pet dog." In anger he upbraided his friend for trifling with his time and interests. However, he set about to treat the dog and when finished made ready to take his leave. Whistler reminded him that he stood by his promise to freely pay and that Dr. Mackenzie should promptly send his account. Mackenzie replied, "My back fence needs painting. Paint it." In due time Whistler presented himself at Dr. Mac-

kenzie's home fully equipped to paint the back fence. Whistler set to work and painted the fence and asked his friend to inspect his work. Mackenzie found the fence not only well painted, but a graphic cartoon added—of Dr. Mackenzie treating his pet dog. (It is needless to say that the back fence had to have another coat of paint.)

During Dr. Mackenzie's stay in Philadelphia we consulted him about an instrument which he had invented, which he called an oesophogeoscope. This little affair is very ingeniously constructed, but in striking contrast to the oesophogeoscope of today (perfected) and so marvelously useful in the skilled hands of members of our Association. This oesophogeoscope of Mackenzie's was not very effective even in its limited range, by reason of the mirror at the top becoming clouded or defaced by mucus, when in use. No convenient way offered to warm the mirror. I offer the oesophogeoscope for your inspection.

To pass on to another Philadelphian, Dr. Harrison Allen, the erudite philosopher and able rhinologist, was a prominent factor in rhinological activities in Philadelphia. He held many positions of honor in the scientific world and had an enviable position in his special field of practice. By some he was held to be the founder of rhinology. His many-sided intelligence gave to him superior advantages; and his productions, as you all know, were of the highest order.

Dr. Allen was an absorbed student all his life, and loved the scientific pursuit of knowledge first of all. A friend of his once said he thought Dr. Allen should have had an endowed position on some laboratory of research—that he thought he *practiced* rhinology "for the damned guinea that was in it," as was said of a distinguished British surgeon.

Dr. Carl Seiler was another member of our Association who was developing laryngology and rhinology when we returned to Philadelphia. He was a fine microscopist, as the archives and transactions testify. He also had a good knowledge of music and was a good linguist. Dr. Seiler had an artistic temperament. A very keen observer, he was quick to notice a new disease. With the advent of the first epidemic of Russian influenza, not being able to place it at first, he called it "It" and published a paper

under that title. His private practice was large. As we knew him best he had many interests. A man of advanced knowledge in rhinology, and a practitioner of bold procedure, Dr. Seiler's keen insight in disease is illustrated in an anecdote concerning a young woman who consulted him for some laryngeal affection. After his inspection with the mirror he advised her to consult a gynecologist. This was probably an early example of diagnosis of reflex disease. The magic power of the laryngeal mirror was never better illustrated. Many years afterwards at our dinner in Boston Dr. Seiler was called upon to speak for Philadelphia. His introduction by the genial and witty toastmaster, Dr. Simpson, was as follows: "Mr. President and Fellows: I am about to introduce to you a gentleman who probably occupies the most unique position of any man who ever lived, in that he has tablets erected to his memory before he is dead."

Dr. Charles de Sajous was a colleague of mine at Dr. Cohen's clinic. He was an interesting and interested student. His inventive talent produced instruments of value and were cleverly ingenious. Today some of his instruments are daily used adjuncts to efficient practice (in our specialty). Dr. Sajous' studies and their development in sensitive areas in the nasal chambers as causative factors in the development of hay fever created wide-spread interest and led him to institute electric cautery as a remedial measure. This treatment was accepted by many and was followed for several seasons. Dr. Sajous' volume on diseases of the throat and nose was published in 1884. Some years later Dr. Sajous had an inspiration and went to Paris. From there his investigations in (another field) "ductless glands" and internal secretion were made. These studies are all classical and have won, and are winning, for him well deserved renown. This new field is epoch making, in the production of a new physiology of the blood current in the automatic regulation of vital functions.

We understand Dr. Sajous expects to present a new and valuable and flattering study next year which will redound to the honor of our specialty.

Among many valuable papers issued, one, a paper by the scholarly Dr. Carroll Morgan, of Washington, on diphthonia or

double voice, interested us greatly on account of its novelty. A short interval after the publication of this paper a case of double voice was under observation. We were extremely anxious to get a phonographic record of this case. Unfortunately the subject was taken with Russian influenza and was also perturbed at the performance, and could not produce the double voice. Our chagrin was very great and to this day we have regrets that no record was obtainable. A phonographic record at that period, it is probable, would have been the first one of such a vocal anomaly.

Passing to the literature of our specialty, the text books were at first few. Dr. Cohen's book was the only one for a time, and was then and is today a vade mecum, of subjects in laryngology. Dr. Delavan has already so splendidly eulogized this book that no additional encomiums are needed. The 100 laryngeal growths by Dr. Mackenzie, and Dr. Fovel's volume on the same subject were eagerly studied.

Very shortly Dr. Francke Bosworth issued his two volumes which were beacon lights on rhinology. Their influence on the advancement of our specialty no man can properly estimate. To-day they stand as monuments to Dr. Bosworth's learning, skill and advanced knowledge.

Publications from abroad were numerous and were available in their various languages. Many were very valuable and the work of skilled men.

But, gentlemen, my field of reminiscences is necessarily curtailed, on account of the geographical and numerical limitations of our earlier days. For every fellow now dead or living there is a "hall of fame." Any encomiums we could offer for any man would be but a feeble tribute to their assured place on our roll of honor.

At our present meeting, gentlemen, important business is to be transacted, chief of which is the adoption of a new constitution and acceptance of by-laws. We sincerely hope the Association is fully informed of the subject matter of our new documents, and is fully in accord with the intent and purpose for which they have been written. Our desire is that our new charter rights may offer to every fellow protection and liberty in years to come.

To your chairman there has been a wish that the Association

might design and adopt some artistic insignia or badge of honor,— as a seal of good fellowship to be worn by those belonging to the Association. It may be your desire to further this suggestion.

And now, gentlemen, may we express to you our sincere gratitude for the great honor conferred upon us? We earnestly desire to try to emulate in some degree the splendid records of your former presiding officers, but we bespeak a kindly indulgence on your part during the sessions of the meeting together. We now declare the meeting of the American Laryngological Association open for business as shown in our official programme.

POLLEN THERAPY IN HAY FEVER.

BY J. L. GOODALE, M.D.

Within a few years numerous reports have appeared in regard to the treatment of hay fever patients by the subcutaneous injection of pollen extracts. The writers, among whom may be mentioned Freeman, Noon, Cook, Clowes, Koessler, Manning, Oppenheimer and Gottlieb, have uniformly reported that a certain number of patients so treated have received more or less complete relief from the disease.

The object of the following paper is to report the results of observations based upon 122 cases of hay fever examined during the past 12 months with reference to determining if possible the value of this treatment, and also to ascertain what biological relations, if any, exist between the pollen of different plants.

In the first place, a word should be said in regard to the method of obtaining and preserving the pollen extracts. For many plants, which furnish an abundance of easily detached pollen, it is sufficient to gather the partially opened flowers, bring them into a room without currents of air, and in the course of a few days the pollen may be shaken upon smooth paper. This applies particularly to those plants the cross fertilization of which is effected through the agency of air currents, such as many forest trees and grasses, and certain compositae, particularly ragweed. In the entomophylous plants, where the cross fertilization is largely effected by the agency of insects, the freshly opened anthers may be clipped and gathered. The pollen is then either placed in the solution for extraction, or it may be preserved dry for an indefinite period. I have taken pollen from specimens in my herbarium gathered twenty-five to thirty years ago, of grasses and of ragweed, which on the addition of water excites as marked a skin reaction as would be the case with freshly prepared extract.

The extract is obtained from the pollen by soaking in water for a few hours. I have not found it necessary to subject the material to trituration as advised by some writers, and this is also theoretically unnecessary, since the pollen grains in water prompt-

ly undergo a swelling with solution of their albuminous contents. Several observers have complained of the difficulty of preserving the extract, and say that it is liable to deterioration on standing. After a number of tests I have found an alcohol dilution of 13 to 15 per cent. seems to meet the requirements, and material prepared in this way a year ago has apparently lost little of its efficiency. It is interesting to observe in this connection that we have an example of a natural plant juice, namely wine, in which preservation of its qualities is thus secured. The heavier natural white wines contain a considerable amount of albuminous matter, together with approximately 14% alcohol. More than this percentage checks the further development of the yeast plant, and this amount, while preventing decomposition, does not seem to be sufficient to cause a precipitation of the proteids of the wine.* It is desirable to keep the solution in amber bottles.

A word of caution should be said in regard to the gathering of flower heads for the preparation of pollen extract in the case of those plants which may contain a poisonous substance, as occurs in certain compositae, especially the wormwood family. I have observed a few cases where disturbing symptoms of nausea and malaise followed by the injection of such material to a greater extent than would be accounted for by the actual amount of pollen present. In the case, however, of such plants as the Rosaceae and grasses, these precautions are unnecessary, and we may in the case of the latter, find it more convenient to strip off the flower heads or anthers by hand.

When the pollen has been gathered, and a suitable extract prepared, the latter constitutes then the stock solution from which varying dilutions are prepared. It is theoretically desirable to prepare the stock solution with a definite percentage of pollen-extract, but with present laboratory methods this is difficult, and, moreover, it is not absolutely essential, since individuals differ very widely in their degrees of sensitization, and each case must be examined by different dilutions, to determine the correct strength which it is safe to use for the patient.

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*Wines containing 15 per cent. of alcohol may be kept without alteration. A percentage of 12 to 13 is not sufficient to keep some wines from undergoing decomposition. Enologia, Ottavi-Strucchi.

As has been described by other writers, and by a previous publication of mine, the tests are made by making a series of superficial scratches on the skin of the arm, and gently rubbing in a drop of the pollen extract to be tested into a scratch. After five to fifteen minutes the positive reactions are indicated by varying degrees of local disturbance. These disturbances of the skin may be ranged in order of intensity as follows: In some cases the first perceptible alteration consists in a sharply circumscribed white area, not elevated, bordering the scratch for a distance of 1/16 to ⅛ of an inch. We may find in other individuals the first manifestation to consist of a slightly reddened raised area. In more pronounced disturbances the area of swelling is more extensive, and is more or less white in color, being surrounded by an area of reddening of varying size. When this degree of disturbance appears, it is usually accompanied by itching. It may in marked cases attain a considerable size, the oedematous area reaching one inch or more in diameter and surrounded by half an inch or more of hyperemia.

The intensity of the skin reaction does not always seem to be proportionate to the clinical symptoms of hay fever. I have seen numerous severe cases where the skin reaction was much less than in other individuals who apparently suffered from a milder form of the disease. In the case of children the skin disturbances are relatively less pronounced than in the case of adults, and I have observed several under ten years of age, with apparently well-defined hay fever, who showed no reaction to the prevailing pollens borne in the air at the special season.

Examination of my cases by this method shows that the hay fever season in eastern North America may be divided into four periods, as follows: The first period coincides with the flowering of the earliest blooming plants, the second with a flowering of the grasses, the third with the mid-season flowers of July, and the fourth with opening of the autumn blooming compositae.

Of the first period 13 patients were observed which gave positive reactions to one or more of the following plants:

Coltsfoot (Tussilago).

Dandelion (Taraxacum).

White maple (Acer Dasycaryum).

Willow (Salix nigra).
Alder (Alnus incana).
Birch, white, yellow, and black (Betula papyrifera, lutea, and lenta).
Hawthorne (Crataegus sp.).
Apple (Pyrus malus and floribunda).
Lilac (syringa var.).
Oak (Quercus rubra).
Tulip.
Lily of the Valley.

The symptoms which these early bloomers excite are relatively mild and depend chiefly upon the abundance of the plants in the vicinity of the patients. For many individuals the annoyance is so slight as to be perhaps not worth treating. In others a residence surrounded by maples or oaks, or with an orchard close at hand, may cause considerable discomfort. The most severe cases of this season which I have seen were from maple and oak. If there is only one sensitization the period of disturbance is brief and disappears with the drying or shedding of the flowers in question.

The second period represented by 36 cases is ushered in with the flowering of the grasses. Owing to their abundance and to the range of the blooming period of the different species, it is relatively severe and prolonged. Coincident with their flowering we may find an associated disturbance from many garden flowers, but for the majority of individuals the latter are of minor importance. It is probable that if these June cases can be rendered immune to grasses, the other causes will be borne without much trouble.

The third period, represented by 10 cases, has been shown by my observations to be due in great measure to the mid-season Compositae, such as Field Daisy, Hawkweed, Yarrow, etc. With these are many species reported by patients which are still to be studied, such as Chestnut, Phlox, Mountain Laurel and numerous other plants of restricted distribution.

The fourth period with 77 cases begins with the general flowering of the ragweed, golden-rod, asters and the late Compositae, and lasts until frost. My examination of the fields and roadsides

at this season shows that the common plants other than the Compositae are relatively innocuous, and may be disregarded. Such are in the vicinity of Boston the Wild Carrot (Daucus Carota), Pigweed (Chenopodium), Hardhack (Spirea tomentosa), and other representatives of these families.

From the foregoing observation it is evident that in this vicinity the chief causes of hay fever are the grasses and late Compositae. The early and mid-season forms are briefer and less severe.

The possibility has been suggested that sensitization to proteids may arise through some parenteral entrance of the albumen in question into the body, and that hay fever, for instance, may originate from the contact of a given pollen with a scratch or abrasion of the skin. If this should be the case it would certainly lay the method of testing by skin reaction open to serious objection, as we should thereby run the risk of exposing the individual to numerous sensitization. I have gone over this point carefully with many patients, testing them repeatedly with pollens to which they were originally negative, and have not, in any case, discovered the subsequent development of a sensitization.

Method of Treatment.

The dosage is determined in the following way: After the special exciting pollen has been ascertained by the skin test, a second series of scratches is made at a distance from the first, and different dilutions of the pollen extract in question are applied. It is important not to have this test applied in the vicinity of the skin, which has been reddened by the first tests, as an increased excitability of this region is present, and even a simple scratch will cause localized swelling. The dilutions may be most conveniently made by adding a certain amount of the stock solution to alcohol of the same strength, and a 25%, 10%, 1% and even weaker dilution of the original extract are applied to the second series of scratches. The initial dose is determined by the dilution which fails to excite a definite skin reaction, and for the sake of causing as little smarting from the alcohol as possible, the quantity of material injected should not exceed 5 or 10 drops. I should also recommend postponing the injection of even a small amount until

after the reaction from the first skin tests have subsided, since a considerable amount of absorption from these probably takes place, and the introduction of an additional amount has seemed to me in a few cases to cause systematic disturbance. The injections may be made at intervals of two days to a week, increasing by a few drops at first, and later by the adoption of stronger percentages of the stock solution. To avoid the risk of anaphylactic disturbance I have advanced the strength, at first slowly. After five or more injections have been given, the strength may be increased with greater rapidity. The disturbances occasioned by the injection of the pollen extract below the skin (not intramuscular) consist, when a sufficient strength has been attained, of a more or less well-defined, lump varying from the size of a bean, to that of a pigeon's egg, accompanied by a sensation of moderate heat and itching. It is interesting to note that none of the patients have complained of these manifestations as representing more than a trivial degree of discomfort, and in no case has the disturbance been sufficient to cause the patient to interrupt treatment.

Two instances of distinct but harmless anaphylactic shock were observed, one occurring in August in a man who came in somewhat exhausted from the heat, who showed extremely marked skin reactions, and who received on the same occasion a small dose of the ragweed pollen extract. About half an hour after the administration of the pollen extract he was taken with faintness, nausea and vomiting, and had to be assisted home. The other case was that of a boy who received a dose of grass and dandelion pollen, insufficient to cause local skin reaction, but who a few hours later was taken with moderate prostration, nausea and vomiting. It has seemed to me consequently a wise precaution to make the initial dose approximately one-tenth of that which the patient can theoretically receive with safety. After a number of injections have been given, it is practicable and safe to inject a strength which may cause distinct skin reaction, without exciting general disturbance.

Beyond the immediate anaphylactic shocks above noted, I have seen in a few cases where ragweed pollen has been injected occasionally a more or less marked persistent general depression. Since using the pure pollen extract, such a condition has not oc-

curred in my own practice, but it has been reported to me by patients treated by other physicians. It seems to me here to be a question whether there has been an injection of toxic material other than the pollen, or whether the dosage has been excessive.

Results of Treatment.

We have two methods of determining the effects that have been accomplished by the injection of pollen extracts: first the behavior of the skin reactions; second, the patient's observations regarding his condition. The first phenomena being objective in character should afford a more reliable guide as to what has been accomplished.

Influence of Treatment Upon the Skin Reactions.

In those cases which it was possible to observe for a period of two weeks to several months, the skin reactions were carefully noted at regular intervals. Of these 62 showed a distinct diminution in the size and intensity of the disturbances in the skin, two showed no appreciable change.

The time required for the diminution of the skin reaction varies within wide limits, dependent both upon the plant tested, and upon the individual himself. In the case of alder, willow and apple I have sometimes obtained a marked reaction from the first application, but on repeating the application two days later, a marked diminution or total disappearance was noted. This sudden disappearance following the first scratch was noted also in a case of horse fever, which showed on one afternoon a very extensive swelling from the application of antitoxine to a scratch, but who on the following morning, tested with the same antitoxine, showed no reaction, and has shown none since. In the case of grasses, and even more in the case of ragweed, a slower disappearance of the reaction was noted. With ragweed and cosmos particularly I have observed in some cases a persistence of the skin reaction, even after weekly injections carried on for a period of four to six months. In these more obstinate cases an increased tolerance, however, was noted in spite of the persistent swelling. This tolerance was shown by the disappearance of itching which

the first injections had caused, and by the smaller amount of hyperemia surrounding the oedema.

Twenty-one cases of those whose reactions had diminished in the course of treatment were examined again after the lapse of two to six months. Of these 19 showed no return of the skin sensitiveness, and some of them showed a still further diminution. Three cases after the lapse of three months showed a distinct return toward their original degree of sensitization.

Influence of Treatment Upon Hay Fever Symptoms.

In describing the results which have followed the injection of pollen extracts, it has seemed to me desirable to separate those cases which have received treatment during the hay fever season from those which have been treated during the winter or out of season. I have done this for the reason that it is difficult during the course of an attack to draw accurate deductions from the statements of the patients themselves. We have in the first place to remember that seasons vary in the severity of hay fever symptoms, dependent upon the amount of rain, heat and cold. Furthermore, the individual's predisposition seems to vary, perhaps as the result of his physical state and habits at the season. Finally, the element of suggestion may conceivably play a part. While I shall therefore report the summer cases with reference to the degree of relief obtained, I do not regard these figures as at all conclusive. On the other hand, observations carried out during the winter with reference to changes in the intensity of the skin reaction may be considered a fairly reliable guide, if it be admitted that the strength of the solutions themselves has not undergone deterioration. This latter point is difficult to determine with absolute certainty. Nevertheless, my alcoholic solutions seem now, after the lapse of months, to effect in new cases nearly, if not quite, the same degree of skin reaction, which they occasioned when in a fresh state.

At the date of writing 122 cases have been observed, of which 74 have had more or less treatment, 48 have been seen but once, or are now beginning treatment. Of the cases which may have been considered to have had a sufficient amount of treatment to enable us to draw more or less definite conclusions, 32 were

treated after the onset of the hay fever symptoms, and 47 were treated during the winter or early spring. Of those cases which were treated either at the beginning of or immediately before the hay fever season, 26 expressed themselves as having been more or less relieved, 8 could not see material improvement. In estimating the results actually achieved by treatment during the season I believe that an accurate judgment would place the extent of the relief in a number of instances distinctly below that which the patients themselves expressed. It is conceivable that the element of suggestion plays here a considerable part. Furthermore a certain number of these who thought themselves improved showed little or no diminution in the extent of the skin reaction. It has seemed to me that such cases probably represent too high a degree of sensitization to obtain material relief during the hay fever season, and that a longer period of treatment is required. On the other hand, several of these individuals who reported several months later, showed a marked diminution in their skin reaction, and it was possible then to undertake their treatment, with the result of bringing about still further a diminution in the intensity of the skin disturbances. About one-fourth, however, of those treated during the season experienced after a certain number of injections, ranging from four to twelve in number, such striking diminution in their subjective sensations and in the skin reactions that it seemed difficult to ascribe the gain to anything else than the treatment, the improvement noted having occurred from one to three weeks before the disappearance of their type of hay fever in this vicinity.

The Biological Relations Between Different Plant Proteids or Pollens.

It is evident that in this work a knowledge of the biological relationships of the exciting plants would be of the greatest aid. If, for instance, we can say that the protein of two exciting plants is identical we shall need to inject the pollen of only one.

While we do not know clinically the relation of the different plant proteins, yet from a botanical standpoint they have been studied by serobiological methods by a number of observers.

The methods* employed were the precipitation reaction and the agglutination method. Extracts of the plant albumen were made, removing first where present fats, oils, acids, alkaloids, starches, glycogens and sugar. These extracts were then injected into rabbits, preferably into the abdominal skin. As a rule the interval between injections was from three to four days.

With reference to the time required for immunization of the rabbits, no exact figures can be given. Sometimes a potent immune serum can be produced after three to four injections, but cases also occur where even after ten injections very litle immunity had appeared, at times entirely failed to occur. Apparently the individuality of the animal is a factor. Uhlenhutt mentions that of ten rabbits injected with the same albumin only one showed a potent immune serum. The test is done by removing a small amount of blood from the marginal vein of the rabbit's ear, adding a portion of the extract which was used for injection and centrifuging. If the serum is of high potency a precipitate is shown. The animal is then separated from the others, not fed for twenty-four hours and then killed. The blood is received in sterile glasses from a carotid incision. The serum must be perfectly clear, and show no opalescence. Finally the serum must have no free antigen, that is, the animal must not be killed too early after the last injection. The serum, if absolutely sterile, is easily preserved in dark glasses and closed with sterile cotton.

Precipitation Method. Dilutions of the plant extract are made, beginning with one to two hundred and ending one to 50,000. To each of these dilutions a cubic centimeter of serum is given. After keeping in the thermostat for an hour at 37 centigrade in the more dilute preparations there is a precipitate which demonstrates the value of the serum. The procedure in the case of material related to the original one is analogous. A precipitate shows a relationship, the absence of precipitate indicates that relations of identity with the original albumin are not present.

Agglutination Method. Here one places in different glasses the

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* Physologische-systematische Untersuchungen uber die Verwandtschaften der Angio-spermen. Mez und Gohlke, Cohn's Beitraege Zur. Biologie der Pflanzen, 1913.

same dilution of the extract according to the content of albumin for instance, 1 to 200, and to these glasses different degrees of immune serum are added, 8/100 of a centimeter, 2/100 of a centimeter, 1/100 of a centimeter and 5/1000. These mixtures are then sensitized for two hours in the thermostat, and after the lapse of this time, 4/10 of a C.C. of fresh, active ox serum is added, whereupon in the case of related albumin coagulation occurs. This method has shown itself particularly adapted, provided we have a specially potent immune serum. In any serum, the two methods should be employed before any important results are accepted.

It is desirable in these tests to bring the solution to the same content of albumin.

A large number of families have been already studied with regard to their position in the system. It has been shown that the development of the angiosperms extends from the Selaginellaceae over the pines towards the magnolias, that the yews divide laterally from the pines, while the Gnetaceae form another lateral branch of the conifers and then the trunk runs from the barberries towards the roses and ends with the myrtles. The magnolias and barberries belong to the common stem of the roses and crucifers. The trunk must take a branch below the Ranunculaceae of which the ends are the crucifers and the roses. In phylogenetic respect the barberries are older than the buttercups. Likewise the pea family are closely related to the roses. The trunk then proceeds from the roses to the Crassulaceae and saxifrage family and ends with the evening primrose and myrtles. The mignonettes and Capparadaceae lie between the barberries and mustard family. Since the albumin of the mignonette and Capparadaceae reacts like the albumin of the poppies, it is possible that the branch of the stem between the magnolias and Capparadaceae takes place above the mignonettes, Poppies do not react reciprocally with the mustard. The mignonettes, however, stand close to the violets. The Teasle family, Dipsaceae, which apparently resembles the Compositae, does not react with it, and we have here to do with an interesting case of convergence.

The accompanying diagram shows the mutual relationships of the families which have been studied by their serum reactions.

Compositae
Campanulaceae
Cucurbitaceae
Cactaceae
Loasaceae
Papayaceae
Passifloraceae
Myrtaceae
Oenotheraceae
Papaveraceae
Ulmaceae
Urticaceae
Saurur
Piper.
Myricac.
Moraceae
Fagac
Betulac.
Tamaricac.
Violaceae
Juglandaceae
Cruciferae
Saxifragaceae
Crassulac
Capparidaceae
Legumin
Rosaceae
Polygonac.
Resedaceae
Caryophyllaceae
Amarantaceae
Chenopodiaceae
Portulacaceae
Lardica-
balac
Ranunculaceae
Aizoaceae
Phytolac
Aristolochiaceae
Alismataceae
Nymphaeaceae
Berberidaceae
Menispermaceae
Calycanthaceae
Anonaceae
Magnoliaceae
Gnetaceae
Taxaceae
Pinaceae
Selaginellaceae

Unfortunately the position of the grasses is not given in this diagram, as they belong to a separate trunk, namely, the monocotyledors, but this fact renders it sufficiently evident that their albumen is wholly distinct from that of the dicotyledors. It has, however, been established that they are closely related in their reactions to the Liliaceae.

From the foregoing considerations it is evident that the families which chiefly concern us in this present connection, namely, the Gramineae, the Compositae, the Rosaceae, and certain families of trees, have no serobiological affinity with each other. Consequently an individual sensitized to one family alone would not react to the pollen of a distant group. Where two families are closely related as in the Rosaceae and Leguminosae, a positive reaction might be expected to both. The clinical evidence in this regard extends as yet only to the Gramineae and the Compositae. Clowes showed in 1913 that in individuals sensitized to both grasses and ragweed against the former conferred no immunity against the latter. Much consequently remains to be studied in this respect.

In the case of genera within a given family, a relationship of proteids has been shown to exist as already stated. We should, therefore, expect an individual suffering from ragweed sensitization to react positively also to golden rod and to the other members of the Compositae. A case which reacts positively to Beach Grass would also react to June Grass, Red Top, etc. A case reacting to roses would react to apples, cherries, Spirea, etc. We have, up to the present time, clinical confirmation of this view only in the case of grasses. Noon and Freeman showed that injection with one species of grass would also protect against other grasses studied. While they found the pollens identical, yet some grasses seemed to yield a more active extract than others, and in their later work used timothy grass by preference. My own study of the skin reactions in the case of grasses confirms this view, and as I have previously reported, patients sensitized to one species react positively to others, although one may bloom in June and another e. g. Beach Grass, in August.

Sensitization to the Compositae represents for us in America the most important forms of hay fever. This is sufficiently shown

by the generally accepted opinion of the majority of sufferers, and is confirmed by my own statistics. The question, however, has remained as yet unanswered, whether among the Compositae themselves subdivisions exist of a serobiological nature. While we may admit a sufficiently definite affinity to cause positive precipitation or agglutination reactions among all its members, yet it is conceivable that the proteid of the Compositae may be still further differentiated in a manner corresponding to the different genera. Following the same hypothesis we may imagine an individual sensitized primarily to the golden rod proteid, who may show only in a relatively minor fashion sensitization to ragweed, with which he has perhaps never previously come in contact. He may consequently show marked reaction to the former and but slight reaction to the latter, yet in virtue of the underlying biological affinity of the two proteids immunization to the one may confer resistance also to the other.

During the past year I have studied ten species of the Compositae, representing as many genera, in an effort to obtain light upon this subject. Two methods have been used, first the classification of patients with reference to their reactions or preponderance of intensity of their reactions to the pollen of these Compositae; second, observation whether injection of one special pollen would influence the skin reactions to other pollens.

Classification of Reactions.

A summary of the relative frequency of the various sensitizations is as follows:

Ragweed, 82 positive cases, 24 negative.
Golden rod, 48 cases positive, 50 negative.
Cosmos, 28 cases positive, 25 negative.
Field daisy, 28 positive cases, 37 negative.
Hawkweed, 20 positive cases, 39 negative.
Yarrow, 21 positive cases, 20 negative.
English daisy, 16 positive cases, 19 negative.
Tansy, 11 cases positive, 20 negative.
Coltsfoot, 5 cases positive, 2 negative.
Dandelion, 6 cases positive, 1 negative.

The disparity between these figures immediately suggests the question whether the different test solutions contained proteids of different strength so that individuals with but slight sensitization did not react to certain weaker solutions, when they might have reacted to stronger ones. That this is not the case seems to be shown by the following table of 20 illustrative cases.

TABLE 1.

Cases	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ragweed	4	3	3	4	4	0	3	3	3	3	4	4	4		1	3	1	2	3	4
Golden Rod	1	2	3	0	0	3	0	2	3	4	2	1	3	0	1	1	0	0	4	1
Cosmos	0	4	0		4	0	4	4	4	4	1	0	4		1		3	0	0	1
Field daisy	0	3	0	0	0	0	0	0	2	0	0	0	2	0	1	0	0	3		1
Hawkweed	0	3	0	0	0	0	0	2	1	3	1		3	0	1	0	0	1	0	
Yarrow	0		0	0	0			2	0	1	1	2	2	0	1	0	0	3	0	0
English daisy		2		3				2	1		1				1		3			
Tansy			0	0	0			2	1		2		4		0		0		0	0
Coltsfoot	4										4				4					
Dandelion	4	4												3		1				

The intensity of the skin reaction is shown by the numerals: 0=Negative; 1=Slight; 2=Moderate; 3=Considerable; 4=Marked.

From the above table it is evident that all manner of variations exist in the primary or preponderating sensitizations of individuals. I have been particularly struck by the difference in the grouping of reactions exhibited by patients coming to me from different localities. As yet sufficient data are not at hand to enable me to generalize in this respect, but experience so far has led me to expect a different display of reactions in a patient of my vicinity from that shown in a patient from western New York or from the middle West.

2. *Influence of Treatment Upon Reactions of Related Pollens.*

The second method of determining the relations existing between the proteids in the related genera of the Compositae, has been by the following method: A patient which shows sensitization to, for instance, ragweed and golden rod, is injected in the usual manner with ragweed pollen and observations are made at intervals with reference to the golden rod reaction. In some of these cases so studied it has been evident that with the diminution in the intensity of the ragweed reaction, there is a diminution

likewise in the golden rod reaction, which, however, follows at some distance behind it, until the ragweed reaction has nearly or quite disappeared, when there is a sudden drop in the golden rod reaction. My observations in regard to this point are as yet incomplete and demand further testing before I can regard them as conclusive. There seems, however, here a promising field of study and the method is suggested for the consideration of investigators who are entering upon this work.

If these observations are confirmed, they will serve to indicate that there are slight differences between related genera and yet a fundamental relationship.

From the therapeutic point of view it would follow that while we may be able to accomplish immunization to all members of a given order by the injection of pollen from one, yet more rapid results may be possibly attained by employing a mixture of these pollens to which the individual shows pre-eminent sensitization.

The question may possibly be raised whether the parenteral administration of plant proteids may cause harmful alterations in the organs of the body. Longcope has shown that nephritis may be set up in animals by the subcutaneous injection of egg white. No examinations have been undertaken, so far as I know, on hay fever patients, as to whether the injection of pollen extract has been followed by the occurrence of albumen in the urine. I have made no examination of my hay fever patients in this regard. A case of horse asthma which I have reported elsewhere received for a period of several months weekly subcutaneous injections of horse serum, in doses which finally reached the amount of five drops at each injection. The urine in this case was examined before and after treatment with negative results.

Conclusions: Serobiological methods have shown the phylogenetic relationship of the different plant orders and families. The application of these discoveries to the treatment of hay fever by injection of plant proteids promises to assist in the selection of the specific material required for a given case.

Definite reactions are elicited in hay fever by the pollen of the exciting plants when brought into contact with an abrasion of the skin. The intensity of these skin manifestations may be sensibly diminished by the repeated parenteral administration of the pro-

teids in question. Coincident with the diminution in the skin reactons, there seems to occur an increased tolerance of the exposed mucous membranes to the pollens of the plants employed. Pollen therapy in hay fever may be regarded at the present time as a promising method of treatment, but its value and the permanence of its results remain still to be definitely established.

REFERENCES:

Freeman, J.: Lancet, April 25, 1914.
Cooke, R. A.: Laryngoscope, Feb., 1915.
Clowes: Proc. Soc. Exper. Biol and Med., Nov., 1914.
Koessler: In Forchheimers: Therapeusis of Internal Diseases, 1914 Vol. 671.
Gohlke: Die Naturwissenschaften, April 24, 1914.
Goodale: Boston Med. and Surg. Jour., Nov. 5, 1914.
Goodale: Ibid., May 20, 1915.
Longeope: Journal Exper. Med., Dec., 1913.
Manning: Journal Am. Med. Asso., Feb. 20, 1915.

EFFECTS OF PROTEIN EXTRACTS, FROM FRUITS AND POLLEN, ON THE UPPER AIR TRACT.

BY WALTER F. CHAPPELL, M.D.

For twenty years or more I have recognized that some people suffered from a variety of local irritations of the mucous membrane of the upper air tract, and external auditory canal, which were attributable to eating certain fruits or drinking certain wines. For instance, in the early summer cases of pharyngitis and laryngitis were classed as strawberry throats; in the autumn as cider and grape throats, and an occasional tomato throat. In addition, pain, tenderness and swelling of the external auditory canal were traceable to eating apples or drinking cider. Occasionally an acute sneezing accompanied by discharge and swelling of the mucous membrane of the nasal passages, followed eating quantities of grapes or drinking claret or similar red wines. In a few instances these symptoms were attended by swelling and burning sensations of the tongue and lips. There are children who have stuffy noses, constant colds, pharyngitis and croup due to the nature of food they take. This condition is so well recognized in large boarding schools that indiscriminate baskets of goodies are not allowed, as when received, a new crop of colds and sore throats invariably follow.

Raw apples in my experience cause the greatest trouble and in the greatest number of people, but when one is anaphylactic to one fruit he may be to several others. One patient of mine was greatly effected by apples, also strawberries and grape fruit in a milder degree. This is by no means an unusual history. The cooking of apples, strawberries, grapes and tomatoes greatly modifies these qualities I have described but after cooking if they are taken in large quantities and continued for some time, they still produce irritations of a milder degree. People who manifest local anaphylactic reactions may also suffer from general anaphylaxis after eating shell fish and some fruits. A friend of mine has most alarming and serious symptoms of general anaphylaxis from the minutest piece of strawberry.

Just what part of the fruits mentioned would produce the symptoms and appearances described has always been a great puzzle. In a general way the fruit acids were made to bear the blame. During the past winter while working with Dr. James G. Dwyer, pathologist to the Manhattan Eye, Ear and Throat Hospital, on the protein extracts of pollen, I related my experience with the fruits described and brought up the question as to whether the protein extracts of fruits might be the cause of the conditions I had observed. He thought it quite possible and agreed to make some protein extracts to test it.

Apple, strawberry, grape fruit and tomato protein extracts have been made personally by Dr. Dwyer, but the labor was so great that a physiological chemist was employed to carry out the work under Dr. Gies, Professor of Chemistry at Columbia University, and Dr. Dwyer at the Manhattan.

The first use of the protein fruit extract was on a group of five people, three of whom were known to be anaphylactic to apples, one to strawberries and another to tomatoes, a sixth person was used as a control.

Case 1. Mr. B. consulted me in February last for intermittent pain in the right auditory canal extending behind the ear over the mastoid, and a burning and boring sensation in the auditory canal with tenderness when the ear was moved. This condition had continued for about four weeks and became much worse, although he had been under local treatment. The epidermis around the opening of the canal was red and somewhat swollen and the canal itself filled with moist and dry secretions, the whole case looking like one of eczema. With great difficulty a view of the tympanum was obtained. After reviewing the history of the case a conclusion was made that some general condition was causing the ear symptoms. He observed that grape fruit produced a general irritation of the skin but had not known that apples harmed him. I found, however, that he had been taking two apples a day for several months. Acting on my past experiences the apples were stopped and no further local or general treatment recommended. In five days the ear symptoms and appearances entirely disappeared. On Tuesday, April 6th, last, at 5.30 P. M. Mr. B. was given intracutaneously one minim of apple protein extract, strength 1 to 60,000, also a drop on a small abraded surface and a scarified spot was made on which no extract was placed. At seven o'clock when sitting down to dinner he felt

cramps in his stomach and bowels, soon followed by a strong apple taste in his mouth. He rapidly became ill and was obliged to go to bed. By eight o'clock he was vomiting quantities of a liquid with a strong apple taste. Headache and general muscular pains followed, temperature ran up to 102 F. by mouth, accompanied by profuse perspiration, and faintness continuing all night. In the morning headache and dizziness was severe and on getting out of bed became so faint he had to return. This condition continued at intervals during Wednesday. Thursday, felt better and went to business although weak and miserable for six or seven days. The apple taste continued from Tuesday evening until Friday afternoon. Vomiting was severe and almost continuous the first night and intermittent the two following days. There was some local reaction where the extract was applied to the abraded skin. Where the injection was made the reaction was severe, a deep redness spreading in a circle for an inch and a half from the point of injection. Small dull looking vesicles appeared and gradually coalesced, giving the whole picture one of vaccination for small pox. The local symptoms gradually subsided and a dry scab was removed on the sixteenth day. A dull red spot remained for a week longer, but was not a deep scar, as seen after vaccination.

Mr. B. soon regained his usual health. On the eighth day of May I requested him to begin eating apples and report any symptoms. He took one a day and on the eighth day felt some itching in the right ear. After the tenth apple he reported that he was awakened at night by a burning and boring sensation in the ear canal and it continued at intervals until I saw him. The anterior wall of the canal was slightly thickened and red but otherwise looked normal. The apples were stopped and the symptoms ceased within twenty-four hours. Mr. B. has expressed a willingness to have a trial of apple immunization.

Case 2. Mr. Bon consulted me three years ago for soreness and prickling of the throat and burning of the tongue. The right pillars of the pharynx were red and several similar spots were scattered over the pharynx. No temperature, a diagnosis of cider throat was made and the symptoms ceased when the cider was discontinued. In October, 1914, I saw Mr. Bon again for a severe herpetic eruption on the throat extending from the top of the larynx up the left side of the pharynx and mouth which lasted for about eight weeks, causing great pain and discomfort. Four apples taken within two days of the outset of the herpes was in my opinion the exciting cause. One patient of mine has an attack of shingles if he takes prunes.

Mr. Bon was given apple protein extract in the same way and the same amount as the case just described. No general reaction followed, but the local arm reaction was very similar to the first case, but not quite so severe.

Case 3. Mr. C. in early life had suffered from recurring sore throats in the spring and autumn. Later in life these throats continued and were found to be due to strawberries, grapes and apples. Mr. C. was given the same dose of apple extract as the other cases and treated in the same way. Two hours later a prickling, itching sensation was felt on the extremities, which spread gradually over the body and head. Nothing was apparent by an ordinary examination but a magnifying glass revealed small red spots, which itched considerably when rubbed. The following morning all symptoms disappeared. The local arm appearances resembled the case of Mr. Bon and lasted about fifteen days.

Case 4. *Strawberry—A. B. D.* The smallest quantity of strawberry fruit taken in any way produced severe general anaphylaxis, vomiting, stomach pain, profuse perspiration and faintness. On one occasion he remained unconscious several hours. Mother and one brother similarly affected. On May 18th last had a strawberry proteid extract, strength 1 to 20,000, rubbed into an abraded surface on the arm. No intracutaneous injection was made as the alarming symptoms produced in Mr. B. after the apple injection, made us very careful of similar recurrence. Inside of ten minutes after the extract was applied, the patient's palms became moist and a general pallor spread over his face accompanied by slight pain in the stomach and faintness. The patient was a physician of high standing, most robust physique with a quiet nervous system and great self control. No possibility of suggestion could be entertained. The treatment was given at 5.15 P. M. and about 6 P. M. he took some brandy, but the general feelings continued until about 8 P. M., when after some whiskey and dinner the symptoms disappeared. There was little immediate local reaction on the arm but some redness and a scab is still covering the abraded surface.

Case 5. W. B. has suffered from recurring sore throats and inflammation of the great toe joint, after eating quantities of raw and cooked tomatoes. Tomato protein extract was administered through the arm in the same way as the other extracts. No general symptoms ensued and there was no local reaction following the application to the abrasion, but the intracutaneous injection produced some redness within half an hour but disappeared next morning.

Case 6 *or Control.* Dr. D. was given the fruit extracts exactly the same as the other cases but no local reaction followed.

The experience obtained in these cases naturally leads us to believe that local reaction and in some cases general anaphylactic symptoms might be produced by the use of protein extracts of meat, fish, fruit, vegetables or other foods. Experiments on these lines will be undertaken as our experience grows.

HAY FEVER.

Pollenosis, hay fever, vaso-motor paresis or vaso-motor rhinitis may be considered as a local anaphylaxis, due to different causes. The various pollens effecting a certain group of people, protein extracts another group, again there is a group who suffer at any time of the year when they are overworked or are under great strain. Certain pregnant women form another group and still another due to sexual strain. A few cases occur that cannot be placed in any of the groups. Undoubtedly you will all recognize the classifications enumerated and agree that the treatment depends greatly on the determining cause. All kinds of local and general treatment have been recommended for this variety of troublesome cases but no medication has proved so generally beneficial in my experience as chinchonidia sulphate. I have used this in a great number of hay fever cases and with a high percentage of relief; in fact, I have yet to see any cases of vaso-motor paresis of the upper air tract which have not been favorably influenced by cinchonidina, but no permanent cures.

The treatment by pollen proteids is our new hope for hay fever, but the profession and public are in a waiting mood on this subject. Several of my patients received this treatment in various cities but with indifferent success, and it was not until I heard Dr. Cook's paper read before the Laryngological Section of the New York Academy of Medicine in November last that I was convinced that the work was in the right direction and could be broadened and better results obtained if workers with experience in Rhinology would join the investigations. On consultation with Dr. James G. Dwyer of the Laboratory of the Manhattan Eye, Ear and Throat Hospital, he expressed great interest and willingness to partake in this work. It was then too late to obtain pollen

of any variety but we are greatly indebted to Dr. N. L. Britton, Director-in-Chief of the New York Botanical Garden, who suggested that he would endeavor to obtain some dried rag weed plants from the vacant lots in the Bronx. This was successful and the seeds sown in a box in the green-house in the Gardens. They grew without difficulty and blossomed in March giving us plenty of pollen for use this year. The seasons pollens are now easily obtainable and Dr. Dwyer made some of the extracts, but owing to pressure of work his efforts have been supplemented at the Laboratory of Columbia University under Professor Geis.

The plan of procedure decided upon in the treatment of hay fever cases is to make careful examinations of the conditions of the upper air passages, and in addition to giving the selected pollen protein, to administer internally cinchonidia sulphate. Nothing new as yet has been evolved by us in testing out the pollen for selection or in its administration, but in the manufacture of the extracts, Professor Geis and Dr. Dwyer have some new suggestions which seem valuable and will be given briefly in their own reports.

Dr. Dwyer's Report:

In the actual carrying out of the tests, there were several very important things to be kept in mind. The most important to our minds was to be sure that we had a sterile extract. The difficulty to be overcome here was the fact that to subject such extracts to the ordinary methods of sterilization would probably result in the coagulation of the protein and thus run the chances of spoiling its availability for antigenic properties. The extracts were prepared and kept in alcohol, always keeping under 40 C. so as to prevent coagulation. The extracts were made up in normal salt solution, just before use, the required amount being carefully weighed and diluted to the proper strength.

Strengths of Extracts Used in the Tests.

Extracts.	For Scarification.	For intra-dermic.
Apple	1-1,000	1-60,000
Strawberry	1-20,000	1-600,000
Tomato	"	"
Ragweed	"	"

Before use, these extracts were controlled for bacterial growth, both aerobically and anaerobically, as considering the source of

the extracts, from gardens, etc., the possibility of the presence of tetanus spores, etc., seemed more than a negligible possibility. In all cases, the alcohol seemed to have been sufficient disinfectant. The ordinary method of vaccination of scarifying the skin and rubbing in the extract was used and also the intra-dermic method but no conjunctival tests were made, on account of past experiences with the Calmette reaction. Both the alcoholic filtrate and precipitate were used, thus ensuring that all of the necessary antigenic properties were present in one or the other, as these methods of extraction will insure this fact. The strengths of the extracts in the scarification tests were relatively strong (1-10,000), but high dilutions were used for the intracutaneous tests (1-600,000), as, on account of our experience with the apple extract, we wished to avoid a too severe reaction. This fact may account for the variability in the amount of the local reaction and in the period of time during which the reaction developed and persisted.

As the work develops, new avenues of investigation are opened up and new thoughts suggested. The production of the toxin *in vitro* by means, similar to that employed in the production of anaphylatoxin (proteotoxyn) by the use of fresh serum and pollens of fruits and flowers may shed some light upon the method of action of the toxins *in vivo* and give us a means of better understanding the biological principles underlying the whole matter. Thus may be solved some of the present difficulties and an explanation provided for the non-presence of "chemically demonstrable" protein.

As the reactions that occur are systemic in character and as they are analogous to those seen in anaphylaxis from bacterial antigen, it would seem as though we could safely assume that the system in the cases recited above is sensitized to these poisons and that anaphylaxis of a greater or less degree occurs when these proteins are injected. Therefore experiments are being started to test out for the presence of anti-bodies by the complement fixation tests.

It is easy to understand how the poisons are assimilated through the intestinal tract, but how does it occur through the nasal mucosa? Enzymes are present in the nasal secretion and we are now trying to determine whether these enzymes have the power of splitting or digesting protein into volatile or more easily assimable fractions.

Dr. Geis' Report:

Replying to your request for a brief statement regarding our procedure in the preparation of "protein" products from pollen

grains, and strawberries and tomato, permit us to offer the following summary:

I. POLLEN. Ragweed flowers were triturated thoroughly with sand in a mortar. The powder was passed through a column of five sieves of decreasing mesh-dimensions, the smallest of which at the bottom permitted only the pollen grains and the very finest extraneous particles to emerge. This crude pollen was then put into a small glass-stoppered bottle and treated there with just enough 5 per cent. solution of common salt to cover the material. Several drops of toluene were added to inhibit bacterial action. The mixture was shaken frequently and kept over night in an incubator at 37-40°C.

A. First Extract. (a) *First Precipitation.* The extract obtained in the manner described above (25-30 cc.) was filtered and poured into four volumes of 90 per cent. alcohol. A light, white, flocculent precipitate was thus obtained immediately. It was filtered off, allowed to dry on the paper and then dissolved in a very small amount of water, *into which it disappeared promptly and completely.*

(b) *Second Precipitation.* The aqueous solution of the first precipitate from the first extract (A,a) was poured into four volumes of 90 per cent. alcohol. The resultant precipitate was collected on a filter and given, in pasty condition, to Dr. Dwyer, *i. e.*, before it was wholly freed by desiccation from adherent alcohol.

(c) *Filtrate from the First Precipitate.* The alcoholic filtrate obtained by removal of the first precipitate from the first extract (A,a) was evaporated to dryness on a water bath at a temperature between 35°-40°C.

B. Second Extract. (a) Extraction with 5 per cent. salt solution (as described in paragraph I) had no noticeable effect on the size or appearance of the pollen grains. After their separation, by filtration, from the first extract (A), they were returned to the bottle, and treated there with 1 per cent. sodium hydroxid solution and a few drops of toluene, and the extraction process, over night at 37°-40°C., repeated. This extract was filtered, neutralized, and precipitated with four volumes of 90 per cent. alcohol.

II. STRAWBERRY. A. Precipitate. Fresh strawberries were macerated in a moderate excess of 5 per cent. common salt solution, in a glass-stoppered bottle, at 37°-40°C. over night, with toluene as the preservative. The liquid was filtered and the filtrate treated with four volumes of alcohol. The gummy precipitate was desiccated in the open air at room temperature.

B. FILTRATE. The alcoholic filtrate from the gummy precipitate (II,A) was evaporated to dryness on a water-bath at 35-37°C.

III. TOMATO. Products A and B were prepared in the manner described above for strawberries.

IV. REMARKS. Very careful tests of these various types of extracts and precipitates indicates that the proportions of *proteins* present in them are so small as to elude chemical detection entirely or to respond almost imperceptibly to chemical tests. It is well known, however, that biological (anaphylactic) tests for some proteins are very much more delicate than chemical tests. We are endeavoring to determine whether particularly large amounts of extracts, both fluid and precipitated, contain sufficient proportions of protein for chemical detection and identification. We are also fractioning extracts in order to determine which extractive procedure of the many that might be expected to give satisfactory results will afford the maximum yield of "active" material.

Although protein has not been detected in the extracts or its proportion in them is extremely minute, we have assumed, nevertheless, that sufficient *protein* may be present in them to induce anaphylactic responses in your tests. On the other hand it is quite possible that certain non-protein substances, which in plants and animals are used for the *construction* of protein, or which are produced in metabolic *destruction* of protein, or both, may be present in the extracts and may induce, directly or indirectly, anaphylactic phenomena. We refer especially to such substances as betaimid-azolyl-ethyl-amin.

Discussion.

Dr. Burt R. Shurley, Detroit: This is the first logical, scientific work which looks to the future solution of the problem. I have been extremely interested in the working out of the question of sensitization to the pollens of ragweed and golden-rod, which are the only pollens I have been able to secure. The whole question of anaphylaxis and sensitization has been explained by Vaughan, of Ann Arbor, by the splitting of the proteids and the elaboration of toxins, ptomains and leukomains. His theory is very rational. He has shown that egg-white will kill a guinea pig in a short time. A toxic dose after the ninth day may be fatal.

A number of Dr. Goodale's observations I have been able to

confirm as I have worked along. If the dosage is run too high the depression is great, resulting, perhaps, from the influence of the toxin.

One laboratory has turned out, from the clinical standpoint, practically all the stock pollen toxins which can be used in hay fever. Fifteen doses in ascending scale may be found on the market. The clinical value of this I do not know, but it is claimed that fifty per cent. of hay fever patients are absolutely protected during the hay fever season.

Dr. Emil Mayer, New York City: The question of standardization is very important. Standard solutions, not stock solutions, should be employed. Standardization can be done and must be done, just as in the Pharmacopeia, in which each drachm of a fluid extract represents 60 grains of the drug. Because we are still in the experimental stage I resent the rushing in of a chemical firm and the presenting of a stock pollen. The work presented to-day is very gratifying, and we are, I feel, about to realize important results when the treatment becomes simplified.

I have not employed the calcium salts, but will do so, and will be glad to report thereon.

Dr. Harmon Smith, New York City: The first patient mentioned in Dr. Chappel's paper is one who had previously been a private patient of mine for eczema of the external ear. I thought his eczema due to underlying acidosis and had cautioned him against certain uric acid producing foods, but had never thought of apples. Under my care he made only temporary improvement.

The patient was a very large man of fine physique, weighing over 180 pounds and manifesting no neurotic symptoms. I saw him shortly after his vaccination and a large welt had formed on the vaccinated arm. The induration occupied about two-thirds of the circumference of the arm. He was a very sick man and gave every evidence of physical depression. His skin was pale and clammy, hands shaky, tongue coated, head ached, pulse rapid, and all other marks of systemic disturbance were apparent.

I wish also to state that the doctor mentioned in Dr. Chappell's paper is a personal friend of mine, and I can positively affirm that the reaction from the vaccination of the strawberry was due entirely to the effects of the protein as the gentleman in question is as far removed from neurotic conditions as one could reasonably expect in any human being.

Dr. Max A. Goldstein, St. Louis: These reports convince us that we have been working in the dark for the last few years. Animal proteids, vegetable proteids, and the whole series of proteid substances and their anaphylactic reactions, will have to be reduced to a system before any practical clinical work will be accomplished in hay fever. Standardization is necessary for practical purposes. Unless we can reach a more definite and limited basis we will never see the end of this large field.

I have in mind the wife of a physician, an internist of unusual standing, who has used calcium salts for the second season, with no practical results as yet.

G. H. A. CLOWES, BUFFALO, BY REQUEST.

Noon and Freeman, working in Wright's laboratory, were the first to obtain successful results in attempts to immunize against hay fever by injection of minute doses of the pollen causing the condition. Their experiments were carried out for the most part with timothy, which is the principal cause of the spring variety of hay fever.

So far as I am aware we were the first to carry out experiments on active immunization against the American, or autumnal variety of hay fever, caused by ragweed and golden rod. Our method of procedure differed somewhat from that employed by Noon and Freeman in that we prepared our material by precipitating the pollen with an excess of a mixture of acetone and ether, and subsequently extracted the dehydrated material with water, instead of using the more cumbersome procedure of repeated freezing and thawing of the pollen suspended in water.

We also employed a somewhat smaller dosage and controlled our results by means of ophthalmic, cutaneous and blood tests.

The results of the preliminary experiments carried out in the summer of 1912 were reported at a meeting of the Society for Experimental Biology and Medicine early in 1913 (1).

During the summer of 1912 eight cases were vaccinated, starting with an initial dosage of .1 to .2 cc. of a one in a million solution, calculated on the weight of the original pollen, injections being repeated at intervals of two to four days, the increase in the amount employed at each injection being regulated by the results obtained from the ophthalmic and cutaneous tests. Generally speaking, the best results were obtained by increasing the dose from 50 per cent to 100 per cent each time until at the end of eight or ten doses a final dose of .1 to .5 of a one in ten thousand was reached. Owing to the occurrence of a slight anaphylactic shock in one or two cases when larger doses were employed, we deemed it inadvisable to exceed this limit.

The development of immunity was extremely marked in certain cases. Whereas at the commencement of the experiments the introduction of .1 cc. of a one in three or four hundred thousand into the eye would cause flushing and extreme irritation, at the end of the vaccine treatment it was possible to use solutions as strong as one in a hundred without producing any serious discomfort; and it was particularly noticeable that with the development of immunity whatever flushing and irritation might be produced in the eye would tend to disappear much more rapidly than prior to treatment. The same was true of the cutaneous condition. The large white welt, produced either by scratching the skin and applying a drop of pollen of a given concentration, or following the subcutaneous injection of the pollen toxin, was less marked than at first even though a considerably increased amount was employed, and furthermore tended to disappear much more rapidly than at first.

That this development of immunity resulted from the vaccination procedure and not as a result of natural immunization in the course of the hay fever season, was proved by immunizing individuals susceptible to timothy out of season, and also by immunizing individuals sensitive to both timothy and ragweed

against one only of the pollens to which they were sensitive, a marked increase in resistance to the pollen in question being observed, while the sensitiveness to the other pollen was unchanged. Shortly after the completion of a vaccine treatment the sensitiveness once more increased and in tests made in the middle of the winter and the early spring the individuals employed in these first experiments were proved to be almost as sensitive as they had been prior to treatment.

Since that time, working in conjunction with Dr. F. W. Hinkel, I have carried out experiments in three succeeding seasons not only on the original subjects of experiment, but on some sixty additional cases, using a large variety of pollens; and have been able to prove that at least 50% of cases derived marked benefit from a systematic vaccination with minute doses of an extract of the pollen to which they are sensitive. By far the greater proportion of hay fever cases are susceptible to the pollen of ragweed and golden rod. The next commonest cause of the condition in our experience is the pollen of timothy, orchard grass and other members of the graminaceae family. We have also found individuals suspectible to the pollen of dandelion and a variety of other plants. We found one remarkable case in which an individual suffering from hay fever in June did not appear to be sensitive to the pollen of any of the plants at that time in bloom, and finally proved to be excessively sensitive to a variety of fly prevalent at that period, and by preparing a suitable extract of the fly in question we were able to produce a marked immunity and relief of symptoms.

We now have at our disposal records of cases treated three and four years in succession, and it is interesting to note that a greater alleviation of symptoms appears to be obtained in each succeeding year of treatment, although the cutaneous and ophthalmic tests made in the intermediary periods would indicate that the development of immunity is only temporary.

We have carried out careful experiments on the use of calcium lactate and calcium chlorid, either alone or in conjunction with the vaccine treatment. It is a remarkable fact that whilst in certain cases we have seen the ophthalmic test diminished one thousand-fold and the hay fever symptoms relieved by taking

calcium lactate alone, other individuals have been found in which calcium lactate exerts practically no effect. Again, one individual may exhibit an almost complete relief from hay fever symptoms under the influence of systematic vaccination and another apparently comparable case shows no appreciable benefit. We are inclined to believe that the more severe the symptoms of hay fever and the greater the reaction obtained before the commencement of the experiments from eye and skin, the greater is the chance of securing a complete alleviation of symptoms by vaccination. Those cases, particularly the asthmatic group, that exhibits only moderate hay fever symptoms and give only slight cutaneous and ophthalmic reactions when tested, are extremely difficult to immunize, raising the question as to whether we have actually discovered the particular pollen or foreign protein to which they are especially sensitive.

There can be no doubt that a very large proportion of mankind is sensitive to some variety of foreign protein, frequently derived from food. We have had the opportunity of investigating not only a large variety of cases susceptible to pollens but also, as stated above, a case susceptible to flies and a variety of cases susceptible to fish, apples, horses, etc. We were much interested in the results reported by Dr. Chappell on injection of the protein of apples in individuals sensitive to that fruit. The results obtained corresponded very closely with those which we ourselves have had the opportunity of observing in other directions.

In conclusion we would wish to sound a note of warning against promiscuous experimentation with these extremely powerful pollen toxins. The administration of an over-dose to a sensitive individual may readily produce a serious anaphylactic shock, and we feel that we cannot protest too strongly against the shot-gun procedure which has recently been developed in certain quarters of utilizing mixed pollen extracts for vaccination, a procedure which, in our opinion, is liable to render an individual sensitive to other pollens than those from which he is already suffering. It behooves us to be extremely cautious in adopting vaccination procedures against foreign proteins, until the susceptibility of the individual to the specific protein in ques-

tion has been amply demonstrated, and it is to be hoped that some better means will ultimately be found of counteracting the tendency to protein sensitization which, under conditions of modern civilization, appears to be increasing.

Dr. Goodale, closing the discussion: I wish to express my disapproval of a preparation on the market of what might be called a shotgun prescription for hay fever. As I understand it, it contains several pollens and is to be used in the majority of cases of hay fever. It is possible that in a patient with one sensitization to our pollen the injection of this product might develop sensitization to another pollen.

Dr. Chappell, closing the discussion: I wish to thank Dr. Clowes for taking the trouble to come from Buffalo to tell us about this work. He has not been given all the credit due him.

PAPILLOMA OF THE LARYNX.

BY THOMAS HUBBARD, M. D.

Reports of Cases.

Case 1. *Papilloma of Larynx. Microscopical Diagnosis Adeno-carcinoma.*—H. L., aged 35, brass worker, hoarse for six months. First seen October, 1897. Voice restored by removal of small papilloma. In October, 1903, a papillomatous growth above vocal cord, left side, was removed and examined microscopically. Diagnosis: probable epithelioma. A few months later character of growth changed—smooth and more vascular in appearance. This was removed by snare and sent to a New York laboratory for diagnosis. The report was adeno-carcinoma and thyrotomy advised. It should be mentioned that just prior to this operation his wife died following operation for supposed cancer of the breast. In March, 1904, there were many small growths above vocal cords, both sides, and one quite large in the anterior commissure. In June, 1904, the larynx was thoroughly cleaned out by snare and forceps and soon thereafter I cauterized with trichloracetic acid. This method deserves special description.. I had a brass tube made—like an intubation tube with thin walls and fitted to the O'Dwyer introducer. This tube had a small opening below for breathing and a large fenestrum opposite the site of the papilloma. When the tube was in the larynx respiration was easy and the base of the growth after removal by curette was thoroughly rubbed with crystals of trichloracetic acid. After swabbing and spraying with alkaline solution to neutralize and remove excess of acid the cannula was withdrawn. The escharotic action was confined to the fenestrated area and there was no serious reaction. The growth did not return for five years. In 1909 voice was normal, but I found a small fibrous nodule at the original site. As he had no inconvenience he refused to have it disturbed. On my advice he had given up foundry work and followed farming with decided benefit to his general health.

This man was certainly a proper candidate for thyrotomy and radical extirpation of tumor in 1903. Clinically and microscopically it had malignant characteristic.

The latest report I have is dated 1913, and there is no active recurrence.

Case 2. *Multiple Papilloma of Larynx. Asthma a Complication.*—Mrs. B., aged 40; hoarse for nine months, laryngeal dys-

pnea for weeks. I saw her in November, 1913, and she was then in critical condition. She had suffered from asthma of very severe type for years, aggravated in summer and fall by hay fever and of late had laryngeal dyspnea due to the papilloma. Between the three, asthma, hay fever and laryngeal obstruction she had a sorry time of it. Morphine and adrenalin gave some relief. Operation was very difficult, as she had the usual hyperaesthesia of mucosa and no self-control. In several sittings, under local anesthesia supplemented by large hypodermic of morphine and adrenalin, the larynx was fairly well cleared by direct and indirect method. The tumors were removed from above and below vocal cords. Subsequent operations failed because of the asthma. She no longer responded to morphine and adrenalin and the least irritation of certain areas within the larynx would precipitate most violent attacks of bronchial spasm lasting for two hours or more. She was simply impossible—a hyperaesthetic, neurasthenic, angio-neurotic, but fortunately the papilloma did not grow. Examined in 1914 and she is enjoying fairly poor health as usual with a few warty nodules visible.

Case 3. *Congenital Papilloma of Larynx.*—R. G., aged 4; hoarse since birth. Operated for enlarged tonsils and adenoids nine months prior to consultation. Since then aphonia and progressive dyspnea. When I saw him in April, 1912, he was exhausted from loss of sleep and the retrocession of lower thorax was so extreme that the lower arch fairly curved upwards and backwards. Tracheotomy gave relief and I allowed him to recuperate for a few days. The edges of the tracheal incision had been stitched to the skin and under general anaesthesia I curetted by direct method from above and also from below. Rather more papillomata were removed through the tracheal opening than through the laryngeal cannula. They seemed to come off more easily from below and with very little bleeding. He left the hospital in five days with good voice and there has been no recurrence to date now more than three years. The father writes that he has a clear singing voice.

Case 4. *Papilloma of Larynx in Child.*—M. D., aged 8. No voice for two years. Past two months increasing dyspnea. I saw this case rather incidentally. The physician in charge had diagnosed heart dyspnea and had given such a hopeless prognosis that the parents had decided to let her die. But she didn't pass away as predicted and counsel was called. I found a little skeleton of a girl fighting for her life; no sleep for four days and nights and on the verge of exhaustion. After the tracheotomy she slept for thirty-six hours and it required three weeks of care-

ful nursing to get her into operative condition. Curettment from above and below cleared the larynx temporarily. The voice returned in a few days and improved for about six months. The recurrence of papilloma was in evidence about a year later and by the same method I removed one large mass. Since then, now one year, she has a good clear voice. Massage of the larynx and neck has been practiced since the last operation. She can sing well and probably there will be no recurrence. Since the last operation she has had successive crops of warts on the hand. The coincidence of warts and laryngeal papilloma is not rare, and in fact, they are embryologically related. The behavior of laryngeal warts and skin warts indicate that they are both trophic in origin and further, in the eccentricities of active growth and contagiousness as well as magical disappearance they are alike. Perhaps we would do well to adhere to the Virchow nomenclature *Pacchydermia verrucosa* in certain types of *papilloma laryngis.*

Case 5. *Papilloma of Larynx.*—L. N. C., aged 35. Aphonic for six months. Patient recently discharged from the smallpox hospital. Larynx quite full of small papillomata originating chiefly from anterior commissure. In the course of a year I operated twelve times—once under general anaesthesia by the direct method—using forceps and curettes. His larynx was clean—no growth visible—at least six times, and the voice was good, but the growths sprang up everywhere. They seemed to take root by contact. Even the under surface of the epiglottis, where the laryngeal tube used in direct method had made pressure, developed a fungus-like mass within three weeks of the slight trauma. I tried various local applications: alcohol, fused nitrate of silver, tricholacetic acid, etc., after thorough removal, but it seemed useless. In all these operations I had carefully avoided laceration of deeper mucosa. In January, 1914, I made a thorough operation with Krause forceps and got a clear larynx. Massage of the larynx and neck had been practiced at brief intervals for a month prior to operation and has been continued for now five months subsequently. To-day there is not a trace of growth or scar tissue. The voice is clear and a good result seems assured.

This group of cases, method of operating and results, presents only two features out of the ordinary. Curettment from below is worthy of commendation. With the head bent backward it is not difficult to pass the curette through the enlarged tracheotomy wound well up into the larynx and having the firm cricoid ring to curette against it is easier to detach a papilloma at its base than when curetting upward with only the more yielding false

cords and thyroid for resistance. In doing a thorough curettment by this route one must guard against hooking the tip of the arytenoids—otherwise the instrument can be swept freely over the whole interior taking care to extract all fragments through the tracheal opening. I fancy that one can tell when the crop of warts is ripe by the way they yield to the curette and the absence of copious hemorrhage. It does not seem necessary to resort to the method recommended in papilloma laryngis of childhood by Clarke and others—tracheotomy and complete arrest of laryngeal function for a long period. The risks of prolonged tracheal respiration must be reckoned with. It is sometimes difficult, even impossible, to re-establish laryngeal respiration in these cases. There seems to be a reversion of the normal action of the larynx in prolonged tracheotomy respiration. It is more comfortable to the patient to breathe wholly through the cannula than to allow partial laryngeal respiration. Consequently the habit of closing the larynx during inspiration is gradually acquired. We observe this reversion of physiologic action in many mouth breathing children—the alae are closed during inspiration to prevent air passing through the mucous clogged nares and the habit is sometimes permanent even though the nasal passages become perfectly clear. In papilloma laryngis of childhood I would recommend early and careful curettment, repeated when necessary and present the instruments which I have found to be effective. These curettes are chiefly of the Coakley sinus type with long handles for the upper direct method.

And a few words about massage of the larynx as an aid to prevent recurrence. This method should be thoroughly tried—manipulation of the larynx with deep massage up and down laterally and including all of the neck muscles and nerves. The strain of phonation in cases having laryngeal neoplasm produces abnormal muscle tension. The mere consciousness of this impediment to phonation tends to cause a more or less persistent muscle cramp from the submaxillary region to the anchorage below, the sternum and clavicles as well as in the intrinsic muscles. This condition may be the cause of the nutritional disturbance. Certainly it is a factor in producing the contact irritation which is conducive to epithelial hyperplasia. As in the last case

mentioned, massage supplemented by hot fomentation followed by tonic cold applications, should be begun some weeks prior to the thorough operation and continued thereafter for a few months. The psychic effect is positivelyy beneficial, and, further, I am confident that my final operation in the last case was made more easy by the absence of the uncontrollable spasm formerly experienced. This is a refinement of detail which is worthy of trial.

Lynch of New Orleans has a method and a special direct technique which bids fair to quite revolutionize intra-laryngeal surgery. His modifications of the suspension apparatus, and his special instruments are the products of a genius. Certainly surgical technique of laryngeal operations is perfecting along new lines and we reluctantly give up our old methods.

One object in presenting this paper is to bring up the discussion of the advisability of operation and re-operation in this class of recurrent neoplasms of the larynx and particularly in the young. The prevalent teaching is that we should try to give the larynx complete rest. This method is, it seems to me, unphysiological and to a degree unsurgical. Tracheotomy is necessary in most of these cases, but the sooner the tube is out the better. The object of laryngeal rest is to restore normal nutrition and lessen irritation. It is probable that external massage is beneficial in precisely the same manner. Along the same line I would also suggest that voice training and easy phonation should be encouraged. In other words, give the voice organ a chance to re-establish normal functional activity by removing the offending neoplasm, by early and repeated operations if necessary and with the least traumatism and further aid in restoring normal nutrition by external manipulations and training in voice production.

Discussion.

Dr. J. Payson Clark, Boston: I have been very much interested in this paper, but I wish to take exception to Dr. Hubbard's view with reference to tracheotomy in children. I cannot agree that leaving the tube in place for a long period hinders the restoration of function of the larynx. I have had patients who have worn the tube for two and three years, and after its re-

moval there was no difficulty in the re-establishment of laryngeal function. It seems to me to be dangerous to remove the tube in children as long as there is any of the growth in the larynx, because there is apt to be an increase of this, and one may face the problem of doing another tracheotomy, which, as is well known, is more difficult than the primary tracheotomy. One of the first cases I ever had was that of a boy, eight or ten years of age, who wore a tracheotomy tube for three years. He went to school all this time and kept up with his class. Several years after the disappearance of the growth and the removal of the tracheotomy tube an apparently healthy young man walked into my office, saying he had come from a town in Maine, and thought I would be interested in seeing how he was. He then recalled his case to me. I found that he had a normal larynx, the vocal cords were perfect, and there was no sign of any growth.

I would also like to register a plea for the indirect method of operating on laryngeal growths. With the invention of all the instruments for the direct treatment of the larynx there is great danger of neglect of the indirect method of operating, which seems to be to me much better for adults in the great majority of cases of benign growth in the larynx.

Dr. E. Fletcher Ingals, Chicago: I would like to ask the reader of the paper about his results with trichloracetic acid. I cannot understand how it can be used in strong solution. Neither do I understand whether the tube, through which he did the cauterization, was removed immediately after the operation or later. If it was removed at once, was there no swelling; or was function restored afterward?

Dr. Clark says a second tracheotomy is more difficult than the first. In my experience a second tracheotomy was much the easier as the cutting was all through scar tissue and there was no trouble from blood vessels.

In curetting the growth from below, was it done by sight—could Dr. Hubbard see what he was doing? I would also like to know whether he used an interrupted stitch in suturing.

Dr. Allen B. Thrasher, Cincinnati: I have seen cases of papilloma of the larynx not very often in adults, because these intra-

laryngeal growths then assume a different character. In children, however, they are very frequently encountered. It is a very common occurrence to find papillomata in the pharynx, at the edge of the pillars or in the region of the tonsils, and it is not unusual to find them in the larynx. When in the larynx one should never operate without telling the patient that the operation will probably have to be repeated. There is not one case in a hundred in children in which it is not necessary to repeat the operation in a short time. The larynx must be kept clear until the child is fifteen or sixteen years of age. There is always danger of recurrence while the larynx is small. I have kept a tracheotomy tube in for four years, without any trouble. It was removed in the meantime, of course, but not left out entirely. In this case I could not see the patient regularly, as he lived one hundred and fifty miles up in the country, and was unable to make frequent visits to Cincinnati. This patient is now perfectly well, and has had no trouble since he was sixteen years old. He wore the tube constantly from his twelfth to his sixteenth year.

I have found tracheotomy more easily performed the second time than the first. I recall one case in which a growth, which had been removed, subsequently became obstructive, and, while the patient was in the chair, dropped into the larynx, interfering with breathing. I did a rapid tracheotomy, put in the tube and the patient is living today.

I am doubtful about the advisability of massage. It seems to me that it would increase the blood flow to the larynx, and this increased blood supply would be apt to stimulate growth. I have had no experience in this regard, but it does not appeal to me as being a scientific procedure. I believe the fact that Dr. Hubbard has not had trouble with his cases is due to accident. I would be afraid to try it in cases of papilloma. In other cases it may facilitate the return of the voice.

In cases of papilloma of the larynx, as in cases of warts elsewhere, I have used nitrate of silver. Warty growths are more easily destroyed than is the mucous membrane and nitrate of silver will destroy the growth without injury to the larynx.

It has been my practice to operate entirely by the indirect method. Others, of course, employ the direct method very skilfully,

but I have had no difficulty whatever in removing any growth from the larynx by the indirect method. In many cases in children it is possible to remove these growths without artificial light. It is often possible to reach the growth with the finger and to remove it without difficulty with forceps.

Thorough excision of the base is essential in these cases. If this is done the tracheotomy tube can be left out, for it will not be necessary to remove the growth the second time.

Dr. John F. Barnhill, Indianapolis: There are two plans, it seems to me, which at the present time offer most hope in the treatment of cases of papilloma of the larynx. In common with others, I have operated over and over in these cases, by both the direct and the indirect methods. We cannot be altogether thorough by either, unless, perhaps, with Dr. Lynch's new plan. I take it that these growths recur because we do not get them out. It has seemed to me, judging from my own experience, to be impossible, under certain circumstances, to get all the growth out, including the base of the mucous membrane. Laryngologists will have to come more and more to the basis of the general surgeon—work in the open. Dr. Lynch's method is largely in the open, and that is why it will prove successful. In all cases in which I have cured this class of disease I have opened the larynx externally and have thus been able to see that I actually removed all of the growth. Laryngofissure is most satisfactory in all bad cases. To open the larynx, to see what is there, and to thoroughly remove it under antiseptic precautions, is a plain surgical procedure, and, with proper closure of the wound is, it seems to me, the best method. After you have tried this plan as a secondary operation to the other in this particular class of cases, you will be amazed when you actually look in, to realize the total lack of "thoroughness" of the work by the old method. In looking into the larynx it is often difficult to see the vocal bands, and how one can go in and "thoroughly" clean these bands—except with Dr. Lynch's method or the external method, I do not know.

The essayist speaks of curetting from below. I should think it would be very difficult to save the cords if they are covered up. Recurrence would probably be much less frequent if we

were less afraid of opening the larynx and more sure that we have seen and removed everything that should not be there.

Dr. Harmon Smith, New York City: A few days ago I had the opportunity of seeing Dr. Lynch operate upon a case of papilloma of the larynx in a boy fifteen years of age.

The history of the case is extremely interesting and has previously been reported by me in an article on papilloma of the larynx in children.

As a very young child, thyrotomy had been performed and all papillomata entirely removed. Later they recurred. A tracheotomy tube was then inserted, which was worn for a number of years. When he came under my observation a tracheotomy tube was still "in situ," but the larynx entirely filled with growths. I employed fulguration, which occasioned the disappearance of the growths sufficiently to warrant the removal of the tube. They recurred, however, and radium was employed, without any apparent benefit. There has remained for a year or more a fibropapillomatous mass in the anterior comissure and extending into the sub-glottic space.

Dr. Lynch suspended this case by means of his new apparatus and was enabled by holding the cord away with his retractors and with his long curettes to remove this sub-glottic mass with perfect ease.

I still believe that fulguration will become an effective method of removing these growths, particularly as Dr. Yankauer has devised an instrument by which a current of oxygen or air is blown directly on the growth at the time the fulgurating spark is applied, which dries out the mass so that the spark will have its full effect.

As I have previously stated in former papers, there is certainly a difference in the infectivity of these laryngeal warts. In taking care of a former series of cases, my own hand became covered with warts. There is also a great difference between the multiple laryngeal warts in children and the single hard wart in adults. In the adult it is very much easier to remove permanently. Radium will often remove these warts in the adult, but so far as my experience goes, it has been unsuccessful in chil-

dren. At present I think we do not know the full pathology of these papillomata. If we can successfully remove the wart, together with its mucous membrane base and can keep the blood of the wart itself from extending to adjacent mucosa, we can have reasonable certainty that the growth will not recur.

Dr. Lewis A. Coffin, New York City: Dr. Smith's remarks about the intrinsic difference in infectivity of these laryngeal papillomata reminds me of what Dr. Jackson said at a recent meeting at the Academy of Medicine in New York, to the effect that there is in these growths something which is beyond the pathologist. Some never return; some, no matter how many times they are removed, will recur. In my clinic I feel hopeless when I see a child with papilloma of the larynx. We have records, however, of cases in children of removal by radium with no recurrence. Dr. Culbert has reported a case, successfully treated by Dr. Abbe. Dr. Harris has reported a case from my clinic, a woman, forty-three to forty-five years of age, whose larynx showed excessive papillomatous growths, whose voice was a whisper, and yet after two applications of radium, lasting from one-half to three-quarters of an hour, every vestige of the growth had disappeared and the voice had become clear after a period of five or six weeks. There has been no recurrence now for more than three years. I have now under my care a man from whose larynx I have several times removed large papillomatous growths by both the direct and the indirect methods. I treated the bases of the growths with applications of monochloracetic acid, and yet the growths have recurred. One year ago, when he phonated, one saw nothing but papillomatous tissue in the larynx, there was a large growth on the laryngeal surface of the epiglottis. Dr. Abbe kindly loaned me one hundred milligrams of the bromide of radium so mounted in a tube that I was able to apply it to the growths.

A marked diminution in size had taken place in 48 hours. The radium was applied for fifty minutes at first application. After two months no one growth had entirely disappeared, but all were much reduced in size. Another application of the radium was made, this time for one hour and now after one month the con-

dition is much the same as before the last application of the radium.

Dr. D. Crosby Greene, Jr., Boston: In connection with Dr. Barnhill's remarks I wish to cite a case which bears out the view these growths tend to recur, in some cases, even after the most careful operation. Recurrence followed in a case in which I operated, and the patient went to another laryngologist who thoroughly removed the growth by thyrotomy under direct vision. Six months later I saw the patient again, and the larynx was entirely filled with papillomatous tissue. Dr. Lynch's method will not be sufficient unless the immunity of the patient has been established. Within the past six months I have seen a case in which the patient presented warts on the skin simultaneously with papillomata of the larynx. Removal of the papillomata in the larynx was followed, within a short time, by disappearance of the warts on the skin.

Dr. Henry L. Swain, New Haven, Conn: Twenty-five years ago I had under my care two cases of papilloma of the larynx, one in a six-year-old boy, the other in a woman thirty or more years of age. The boy was intractable, and passed out of my hands. Nine years afterward he coughed up the remains of his papilloma. I have seen him within the last two years, and he has no growth at all. If he had stayed with me his single papilloma would probably have become multiple. The woman was treated in various ways. After many removals I cauterized with pure nitrate of silver and with electricity; I curetted, and rubbed in lactic acid, and despite all this the papilloma returned. Recently Dr. Sperry asked me to see a patient, thinking he might have to do with a malignant growth. I found my old patient, the woman, with several papillomata. She had coughed off one growth, but the others had remained the same for some years. There was never any obstruction in her case. Whether they will become malignant of course I do not know. In another case I have used alcohol sprayed on the surface of the papilloma, and have certainly prevented the necessity of instrumentation. I have done nothing else in this case and the larynx is now entirely free. The growths have reappeared

four different times in the intervals when no treatment was given, but for ten years I have done nothing but spray with alcohol. This statement is subject to the criticism that the growths might have disappeared if left alone, but I hardly think that true, as they responded so quickly to the treatment. At one time there were five distinct papillomata in this case, presumably because of the attempts at removal. And there never could be a more tractable patient.

Dr. William E. Casselberry, Chicago: In the glamour of the new we are apt to forget the merits of the old. No one has mentioned the galvano-cautery. Years ago, at the International Congress in Washington, I presented a laryngeal electrode which I am still using satisfactorily for papillomata in adults, though not in children. After removal of the growth with the forceps by either the direct or the indirect method, sometimes having used both in the same patient, and with or without supplementary curettage, which always leaves basic shreds, I have found the galvano-cauterization of the base, to be the most precise and efficient method of eradication. I do not understand that fulguration possesses any advantage under these circumstances, although probably better adapted for more diffused action in the multiple growths of children.

Dr. Harris P. Mosher, Boston: Did I understand Dr. Hubbard to say that the tracheotomy tube worn for any length of time interferes with the return of the voice? I have not found that to be the case. This particular part of his theory, while very pretty, is not borne out by the facts.

Dr. James E. Logan, Kansas City: I have had the very best results from curetments and galvano-cautery. Within the past few years I have had two cases of special interest. In one case there was a suspicion of carcinoma. I removed the growth a number of times, large pieces of what appeared to be fibrous tissue being taken out, and followed this with curettment and galvano-cautery. There has been no return. Another case was that of a woman, sixty years of age, the mother of nine children. A few years ago she had every evidence of carcinoma. After removing as much as I could of the growth I used the

galvano-cautery to remove the rest. Today she has as good voice as ever. Fulguration cannot be localized as can cauterization with the electrodes suggested by Dr. Casselberry.

Dr. Robert Clyde Lynch, New Orleans: My experience with papilloma of the larynx covers sixteen cases. I will give briefly the histories of two or three, which will illustrate the results obtained with the method which I have devised.

The first case was referred to me by Dr. Jackson, by whom the patient, a woman, had been treated for two years. He had reoperated every month or six weeks for recurrence of papilloma of the larynx. The patient then removed to my neighborhood. I attempted to operate, as Dr. Jackson had done, wtih his forceps and other instruments. The method in my hands was entirely unsuccessful. At that time I began to use the suspension apparatus. The patient was anesthetized, and I carefully dissected out every portion of the growth which could be seen, both above and below the vocal cords and around the epiglottis. I cleared the area entirely. I suspected that I would have a good deal of post-operative edema, and kept the patient in the hospital for several weeks. Healing was perfect. That was a little more than two years ago, and there has been absolutely no recurrence since that operation.

The second case was that of a little boy, reported before the American Laryngological, Rhinological and Otological Society last year. The patient came into the hospital very much cyanosed, and the fright of coming into the clinic practically stopped his respiration. Tracheotomy was performed and the tube left in place. I thought that would be sufficient to clear up the papilloma, but it had no effect. I operated nine times by the direct method, clearing out each time as much of the growth as I could see. Each time the papilloma recurred. Then I attempted thyrotomy. With the tube in place I opened the thyroid. The child was two years old, and this was very difficult. I was not successful in cleaning out the larynx entirely, and in the course of three weeks it was again filled with papilloma. I left the child alone for six months, with the tracheotomy tube in place. In the meantime I was trying to learn some new method for dealing with such cases. Finally I suspended him, and dissected out the growths

as far down as the end of the tracheotomy tube. That was two years ago, and I saw the patient just before I left home. There was no recurrence. I took out the tube twenty-four hours after doing this dissection. It was the first time in two years that the child had been without it. He had some voice at the end of twenty-four hours, and in two weeks his voice was as good as ever.

The third case was that of a negro woman. I dissected out the papilloma in the same way, and she returned home. She was very religious, had attacks of "hysteria," and she "shouted" and sang, as the negroes do in their meetings, and at the end of six months she came back with papilloma of the larynx. All my operative work in this case had been devoted to the region above the vocal cords. I thought this the first case in which I would have to report recurrence after operating with suspension. In looking over my records, however, I found that our previous efforts had been confined to the region above the cords, whereas the present papilloma was below the cords. This was dissected out, and there has been no recurrence.

It is impossible to remove papillomata completely by any method of punching or pinching or biting, using the forceps in one hand and some other instrument in the other. It is for this reason, I think, that we have so much recurrence. In the sixteen cases in which I have operated by dissection with suspension there has been no recurrence up to the present time.

I have operated, if I remember correctly, upon six children under five years of age; the rest of my cases have been older children and adults. In some there have been single pedunculated papillomata, easy enough to remove by some other method, but in the children all have been of the multiple type.

I do not think I selected the psychological moment, so to speak, for operating in every case—the moment of immunity which would prevent return. I have simply taken the cases as they came, just as a general surgeon would do. I have used nothing to prevent recurrence, for the reason that I was anxious to see just what the dissection would accomplish. The larynx is thoroughly prepared before operation, and after operation the raw surface is painted with tincture of benzoin. Barring the benzoin

and the dissection, nothing has been applied to the larynx which I thought would induce involution of the growth.

With the suspension apparatus as it is now we can obtain a very good view of the larynx, and with that view we are privileged to work with both hands absolutely free. We can see every part of the larynx, the under surface of the cords, the under surface of the anterior commissure—in fact, with a mirror the larynx and trachea are brought into as good working view as is possible. It is certainly as good as in thyrotomy, possibly better.

The voices have all returned very well—in fact, perfectly. The negro woman is still "shouting" in the church meetings. Another patient was a negro vaudeville singer, a man weighing two hundred pounds. He was forbidden to sing for three months after the last operation. He has been singing now for seven months, has been on two singing trips to Panama, and his larynx is perfectly clear.

Dr. Hubbard, closing the discussion: I think Dr. Lynch has devised the most precise surgical method of dealing with these growths. All, however, have not the apparatus for this particular work, and there is always a field for the older procedures. I have found it very useful to put stitches in the trachea. The suture is placed, one stitch on either side, and the ends left long enough to be fixed with adhesive plaster. One can then draw the trachea and the larynx forward, getting a glimpse of the lower end of the larynx. Otherwise the curetting is done blindly. Thorough curettage of the larynx can be accomplished by this method, with curets of various sizes and angles. I always inspect the growth from above prior to curettment.

REPORT OF A FOREIGN BODY IN THE LUNG. THE PRIMARY DIAGNOSIS OF WHICH WAS MADE BY A BLOOD EXAMINATION. REMOVAL AND RECOVERY.

BY GEORGE L. RICHARDS, M. D.

The patient is a young man of twenty-five years of age, with a negative family history. He had what his mother called bronchial catarrh from about one year of age, and from this time until five years of age had occasional attacks of fever and frequent coughing spells. These periods would last from one to ten weeks. About this time he had his adenoids removed, and for a time seemed somewhat better. He had measles, chicken-pox and whooping cough, the latter twice. At twelve years of age he was said to have asthma and was advised by his general physician to go to the country, so his mother took him to California from January to May, 1903. He remembers that at this time he complained of a pain in the lung on the right side slightly below the right nipple. Upon his return he still complained occasionally of pain, chills and fever. The chills would last from two and one-half to three hours, followed by a temperature of 101 to 103, the temperature lasting but a few hours, the intervals between these attacks being from a few days to a few weeks. The mother says that I was called after one of the attacks and said that there was no fever. There was no cough, and immediately after the attack he would feel perfectly well and be all right the following day.

The dates are a little vague here, but as near as I can find out he went through high school, then to a military school, and in 1910 entered the Massachusetts Institute of Technology. He was well enough all this time for his ordinary work in school. A lung examination by a general physician, on what date I am unable to find out, says that there was a little trouble near the right nipple line, but what this trouble was was undetermined. He had an occasional whistle upon breathing which during these

years was thought to be due to chronic asthma. On July 12, 1913, a local physician advised that he have a blood count which showed a white count of 16,120 with an increase of poly's. Medicine was given at this time, but being no better he was taken to a stomach specialist who suggested an X-ray examination. This examination was made by the fluoroscope only and nothing abnormal was noticed. His mother then took him to a diagnostician in Boston, who looked the boy over carefully, but could find nothing particular the matter. He thought whatever it was would pass away, as in the intervals and when examined by a physician he appeared to be in good condition. The mother stated to the physician that the X-ray was negative, she supposing that the fluoroscopic examination was a complete X-ray examination.

Another blood count was made on February 28, 1914, when the white count was 12,200 with slight increase of poly's. In July, 1914, he graduated from the Massachusetts Institute of technology, and before beginning his life work went to Europe for a trip, but on the way over on the steamer had two chills, and again a chill in Florence. In Florence he was taken to a physician, who suggested that there might be some trouble in the right lung, but was unable to determine just what it was. These chills, as stated above, lasted from two and one-half to three hours, and were followed by a temperature from 101 to 103, and as before he appeared perfectly well the day following. He was brought to me on Nov. 30, 1914, I not having seen him professionally for nearly ten years, although in a vague way knowing about him, as he lives in my immediate neighborhood. He was brought to me by his mother to find out whether he was fitted to work in a caisson in one of the New York subways, he having been trained for engineering work. I had a blood examination made at this time and found a leucocytosis of something over 12,000. I went over his chest and general condition and found that he had occasional twinges of pain a little below and slightly to the left of the right nipple. I made a rather superficial examination of the lung but did not detect anything out of the way, nor did I then suggest an X-ray examination. I told him he could probably go on with the work desired. He

went to New York to see about this place, but had a severe chill the first day he was there. He immediately gave up and came home without making any attempt to get the job. He did not report to me, however, until several days later, when he appeared to be all right. He said that he had had another attack since his return to Fall River, but less severe, and that he had been coughing a little. I have never seen him during one of the chills, and do not know that any other physician has. I had another blood count made, this time finding whites 12,480, with an increase of poly's to 88%. A search was also made for typhoid by the Widal reaction, for tuberculosis from the little sputum we were able to obtain, and the blood examined for malarial organisms. These were all negative. On thinking over the case it struck me rather as peculiar that we should have here an apparently healthy young man with occasional attacks of pain, with occasional attacks of chills and fever of very short duration, with only a suggestion of a cough, but with a steady leucocytosis above normal and with no definite physical signs which anybody had been able to determine. At this moment for the first time it suddenly dawned on me that the symptoms were more suggestive of a foreign body in the right bronchus than anything else, a foreign body in a cavity which probably filled up at times, causing absorption, and then emptying itself, remaining open a longer or shorter time. I immediately called his mother on the telephone and said that I wanted an X-ray made. The mother replied that one had been made. I found, however, as above stated, that this was a fluoroscopic examination, and the next morning I took him to the hospital, had an X-ray plate made. This examination showed conclusively a tack in the right bronchus. It is plainly seen in the accompanying picture. Fig. 1.

Any attempt to get any history as to when the tack entered the lung has absolutely failed up to the present. He does not remember ever to have swallowed anything of the kind. A review of the entire history of the case seems to show that very likely the tack was introduced many years before, as when it was finally removed its condition was such as to justify this supposition. It was certainly evident that the tack had been in the lung for some time, at least two or three years. I assumed that it was

probably more or less encapsulated, was probably in a cavity, and that between the head of the tack and the main bronchus there might be quite a band of adhesive or inflammatory tissue, which opinion was confirmed by the hearing of an occasional whistle on auscultation. I had in mind such a case as is described in the English edition of Brünings' book, page 353, and also related

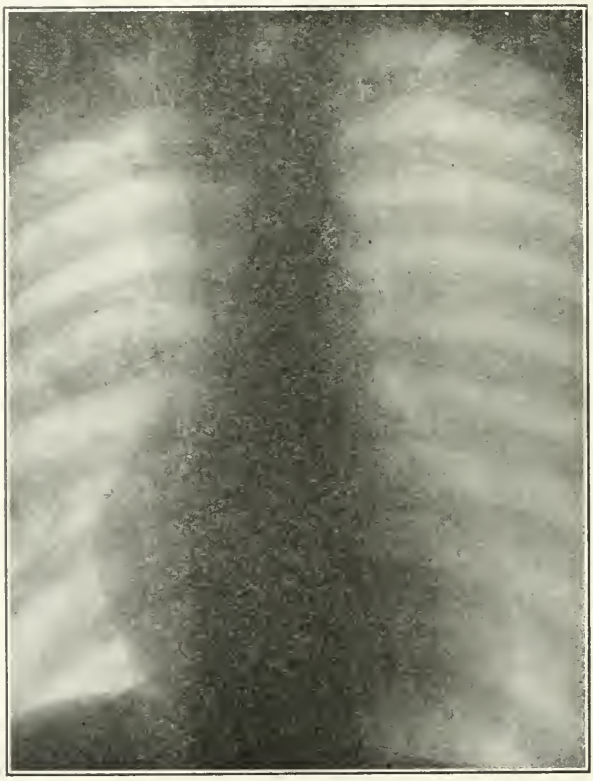


Fig. 1.

to me by Brünings himself, so wishing to put the least possible risk upon the patient, and fearing that I might traumatize him and still not have the tack, I took him to Pittsburgh to Dr. Chevalier Jackson, with a request that he verify the diagnosis, and then if he agreed with me remove the tack.

Two X-ray pictures were taken in Pittsburgh, each verified the diagnosis as to location, and as to the probable narrowing of the bronchus between its location and the main bronchus. Dr. Jackson took the young man to the West Pennsylvania Hospital, where, after previous administration of morphia and atropine, under cocaine anesthesia, and with the aid of the upper lobe bronchus forceps, after dilation of the strictured bronchus, the

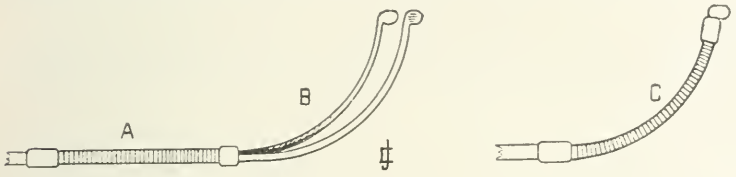


Fig. 2.

Upper-lobe-bronchus forceps for reaching "around the corner" in bronchoscopy for foreign bodies. The jaws, B, are flexible enough to straighten out sufficiently to go through the bronchoscope. On emergence from the distal tube-mouth they spring back to their original curve. The spiral cannula, A, on closure of the universal handle (not shown) travels down over the jaws, which are thus closed, as shown at C.

tack was removed. At no time could it be seen by direct inspection. Dr. Jackson was able, however, to so far feel within the bronchus as to locate the tack first with a probe. After several attempts the head was grasped and removed. To our surprise, however, the point of the tack was not forthcoming and the head of the tack was found to be much eroded and covered with oxidation products. It showed the probability that it had been in this position a long time, and with the result that the tack had been so far rusted away and the oxidation products cast off sufficiently to separate the point of the tack from the head. Two portions of black, iron-like debris were removed, and this was all that could be ascertained of the point. To be sure that nothing was left behind, an X-ray picture was immediately made while the tube was still in position, the X-ray apparatus having been prepared in an adjoining room.

No reaction whatever followed the operation, and I was able to put the young man on the train immediately, and bring him home, twenty-four hours' journey, without an incident. The after history has been entirely uneventful. Recovery took place rap-

idly. In a few weeks he went to New York on a somewhat similar job to that which he had intended to take in the first place, and is now apparently well. No chill or any further trouble with the lung has occurred since the removal of the tack.

While in the light of our present knowledge of this case it is easy enough to say why was not an X-ray picture taken, and the question is a proper one, nevertheless it did not seem to occur to anyone until the thought of why there was a persistent low leucocytosis together with the suggestion of bronchial asthma and the fixed point of occasional pain finally made the clinical picture so clear that I assumed there must be a foreign body there, and therefore had the X-ray picture made. The moral of this is, that in any uncleared up case of possible trouble in the chest, abdomen or anywhere else, the help of the X-ray should be sought with the hope that it may aid in clearing the diagnosis. Again foreign bodies which have been in the chest a long time and are unsuspected are probably far more common than any of us have yet ascertained.

Discussion.

Chevalier Jackson, Pittsburgh: It is doubtful if we all realize the importance of Dr. Richard's work on this case. So far as the removal of the foreign body is concerned the case presents nothing new. In diagnosis of foreign bodies in the lung, however, Dr. Richards has established the leading case—the first and only case in which the diagnosis of foreign body was made in the absence of a history and in which the radiograph was taken to verify the diagnosis. I have seen 12 cases in which the unsuspected presence of the foreign body was revealed by a radiograph taken for general thoracic diagnosis. It is easy enough, now, to say "He suspected foreign body and had a radiograph taken." But how often is a patient coming in for chronic pulmonary disease has care been taken to exclude foreign body? Never to my knowledge. Granting that foreign body was suspected, how many men would have insisted on having a radiograph taken in spite of the statements of the patient (an adult) that he never had "choked on" a foreign body and that an "X-ray examination" was negative Dr. Richards is the only man who has ever done

that. The case is unique in medical literature, and has three interesting phases:

1. It confirms the unreliability of negative fluoroscopy in foreign body cases.

2. It points to the necessity for diagnostic bronchoscopy in similarly suspected but radiographically negative cases; because of the possible presence of a foreign body not dense enough to show in a radiograph.

3. It demonstrates for the first time the value of the blood count in the diagnosis of foreign body in the lung.

FLUOROSCOPIC BRONCHOSCOPY.

(Supplemental Report.)

BY E. FLETCHER INGALS, M. D.

In the Journal of the A. M. A., February 21, 1914, I published a short article on this subject, referring to three cases on which I had operated and including also a case report by Dr. Stanton A. Friedberg. I think both of us now realize that the article was liable to misinterpretation by the general practitioner who might conclude that with the aid of the fluoroscope the operation might be safely attempted by almost any one. Such an impression would be a misfortune, for it would undoubtedly lead to disastrous results in many cases; but to the well qualified bronchoscopist the method will prove a valuable aid in certain difficult cases where the usual procedure has failed.

In inexperienced hands bronchoscopy for the removal of foreign bodies has been attended by a very high mortality, similar to that from splenectomy or deep gall duct operations, and I have no doubt that under similar conditions it will be equally serious in the future; but as individual operators grow more and more skillful the mortality should steadily decrease until it should be no greater than from laparotomies with operations upon the pelvic organs. Nevertheless, even the most skillful must necessarily fail in some instances and fatal results will occasionally follow. I am satisfied that fluoroscopic bronchoscopy will lessen the danger and decrease the number of failures in the conditions where it is indicated.

I think this operation is indicated in all cases in which the foreign body casts a shadow with the X-ray where the ordinary method has failed; but more especially, in the following classes:

First—Those in which there is so much mucus, pus or blood that it is very difficult or impossible to see the foreign body.

Second—Those where granulation tissue covers the foreign body.

Third—Those in which the body is hidden, in an abscess cavity.

Fourth—Those in which a stricture has formed proximally to the foreign body.

Fifth—Difficult cases in which the body is lodged in a bronchus going to the upper lobe of the lung, or in any bronchus where it cannot be exposed by ordinary methods.

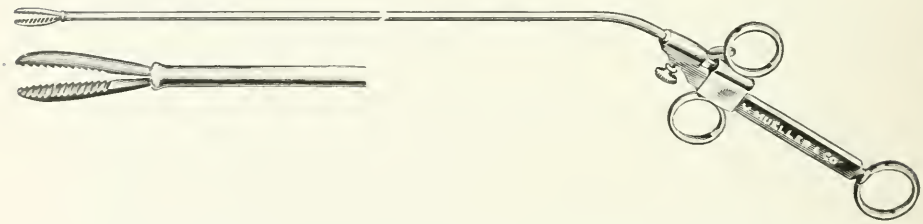
In this procedure one should have a good X-ray apparatus and the assistance of an experienced radiographer. Usually no anaesthetic is required, and it is much better to get along without it if practicable. It is specially important to have a narrow strong forceps with which one is not likely to do damage and one that will not slip when the object has been grasped.

The patient is placed on a special table with the X-ray tube beneath it; and it may be necessary to have a board on which the patient may lie raised four inches above the table, in order that his head may hang over the end. This is desirable because the position of the tube beneath the table sometimes makes it difficult to bring the patient's body near enough to the end of the table so that his head may hang over it.

With the fluoroscope ready the bronchoscope is introduced into the trachea and carried down as nearly as practicable to the foreign body. The X-ray is then turned on. The surgeon standing at the left side of the patient's head and holding the bronchoscope with his left hand directs it by the shadow toward the foreign body. The forceps held by his right hand is passed through the bronchoscope and by its shadow guided down to the foreign body. It should then be moved back and forth laterally to ascertain whether it is in the same bronchus or cavity with the foreign body—if not, or if it is in front or back of the latter its shadow will pass beyond the shadow of the foreign body with these movements. If this occurs, by gentle manipulation the forceps must be repeatedly passed in somewhat different directions until a position is attained where the shadow of the foreign body moves laterally with that of the end of the forceps. The blades are then opened and the forceps passed down a little farther so as to grasp the foreign body. Several attempts may be necessary to accomplish this, especially if the foreign body is in an irregular abscess cavity; but when it is in a bronchus there should be but little difficulty. When the foreign body has been

seized and is shown to be coming with the forceps, the surgeon should not let go until it is brought out, even though considerable traction may be necessary to draw it through a stricture. The operator may grasp the pulmonary tissue instead of the foreign body but by care and gentleness this can be discovered so that injury may be avoided. One should make very little traction until certain that he has only the foreign body, but when assured of this, I think that from 5 pounds to even 10 pounds might sometimes be justifiable, according to the condition of the lung. This, however, must be left to the judgment of the operator.

The forceps I recommend for this operation is a simple narrow, strong tube forceps with file-like surface to blades. 4 m.m. in diameter. Krause handle. The face of the blades is cut like a file with the sharp edges toward the handle. The tube and the blades when closed are only 4 m.m. in diameter. This is an excellent forceps for nearly all work within the bronchi or trachea excepting when the foreign body is of such a nature that it is liable to be crushed.



The cases recorded in my former paper each possessed some special interest and the two cases now reported further illustrate the utility of this method.

The first of these was sent to me by Dr. Bullock of Silver City, N. M. The patient, S. W. P., had inhaled a nail two years previously but no one believed that it had passed into his air passages. After the accident he was thought to be suffering from stomach trouble and he had a good deal of cough with expectoration of some pus and blood and pain in the right chest which finally led to the belief that it was tuberculosis; for which he went to Dr. Bullock's Sanatorium. On making an X-ray examination, Dr. B. found the nail. I saw the patient first April 16,

1914, immediately after my return from California, and attempted a bronchoscopy in my office under cocain, but the patient's throat was very irritable and he jerked the tube out of the trachea before I could see anything.

The X-ray showed the nail at the lower part of the right lung below the fifth rib in front, and between the ninth and eleventh ribs behind. Laterally the shadow was shown about 2½ inches in front of the spinal column. Because of the irritability of the throat, I decided on lower bronchoscopy and because of the depth of the nail, the time it had been in the lung, the probability of an abscess cavity and the amount of purulent secretion, I prepared for fluoroscopic bronchoscopy. Assisted by Dr. Stanton A. Friedberg and some of the house staff, I did tracheotomy under local anesthesia, then took the patient to the dark room and introduced the bronchoscope. I found the bronchus so filled with granulation tissue that it was impossible to see anything below it. I then used the fluoroscope and with the forceps already referred to quickly removed the nail without pain or discomfort to the patient. The patient did well afterward and was discharged from the hospital as soon as the tracheotomy wound had healed. I heard from him recently and he appears to have made a perfect recovery. I recently saw a little patient for Dr. M. L. Goodkind at the Michael Reese Hospital, Chicago, in whom the history and the fluoroscope had shown a metallic foreign body in the right lung. The patient, M. H., aged 5 years, told the parents last October he had swallowed a rivet. The subsequent symptoms had been attributed to the stomach. Following the accident, the boy had been very ill for about three weeks, and he was subsequently under medical care off and on, until about three weeks before he was sent to Chicago; at that time he was said to have developed a pleurisy and had since been coughing and running a temperature of from 102° F. to 104° F. every afternoon, but there was no expectoration.

The fluoroscope antero-posteriorly and laterally showed the position of the foreign body distinctly and from the negative it was located in the second interspace 2 c.m. to the right of the middle of the sternum. We wrapped the child securely in a blanket and without any anaesthetic, excepting a little cocaine

later on to reduce coughing, I did bronchoscopy assisted by Dr. Stanton A. Friedberg and Dr. Ralph B. Bettman and other hospital physicians; but we were unable to discover the foreign body even after a careful search for nearly an hour. Although 1/250 of a grain of atropin had been given hypodermically half an hour before the operation, the mucous and muco-purulent secretion was so abundant that more than 9/10 of the time was occupied in swabbing it out. We carefully explored the whole length of the right trunk bronchus which was free far below the foreign body; but we could not see into any lateral branch. The secretion appeared to come from a narrow opening at or near the site of the first division of the right main bronchus; but on account of the difficulty caused by the secretions even this could not be definitely located.

Finally feeling that the child should not be subjected to a longer examination, I desisted. The patient had coughed a good deal during the operation, but he admitted that it had not pained him. I directed that the child be kept in a croup tent for 48 hours and given 2 drs. of Liq. Amm. Acetatis four times a day. Following the operation the patient did very well indeed and I found him feeling comfortable next morning. The temperature 101.5, pulse 125. The following day the temperature went up to 102°.

Three days later the pulse varied from 92 to 120 and the temperature from normal up to 100° F. With the same assistants and Dr. Frances Turley, the radiographist, I did a fluoroscopic bronchoscopy. When everything was ready, Dr. Friedberg introduced the bronchoscope for me and assisted me in holding it with my left hand while I managed the forceps with my right. I missed the track to the foreign body a couple of times and grasped soft tissues three or four times before I felt sure that I had seized the iron. I drew it out carefully, with 2 or 3 pound resistance as it came through the stricture, with a snap, and then brought it out at the end of the bronchoscope. It proved to be a smooth iron cylinder, part of a rivet, 6 m.m. in diameter and 8 m.m. long. It was a body difficult to hold but the forceps did not slip at all after really grasping it. The patient was put in a croup tent again for 24 hours. The morning following the operation he was in fine

condition, respiration 22, pulse 88, temperature normal. The same day exploratory aspiration demonstrated a sero fibrinous fluid in the pleural cavity. The following day the conditions were the same, the cough and fever had disappeared and the patient was allowed to go home.

On May 11th I assisted Dr. Stanton A. Friedberg with this operation on a child who had an upholsterer's tack in a lung cavity with a proximal stricture which had rendered ordinary bronchoscopy futile; the history of which is herewith appended by Dr. Friedberg. On March 17th, the patient, a girl of 12 years of age, had aspirated a brass-headed upholsterer's tack. The accident was followed by an attack that was called septic pneumonia. Previous to seeing her, tracheotomy had been done and two attempts at removal had been made. I saw the patient first May 8th and did a bronchoscopy through the existing tracheotomy wound. Over an hour's time was spent, mostly in removing pus and secretions. A stricture was found in a secondary bronchus of the right side through which I was unable to pass the smallest tube. A forceps passed through the stricture gave evidence of a considerable cavity. Further effort was postponed until the patient could be brought to Chicago. On May 11th the second attempt was made; with the assistance of Dr. Ingals, the bronchoscope was passed to the site of the stricture through which the forceps was introduced. Through the screen the movements of the tack and forceps could be plainly followed. When the tack was secured the jaws of the forceps could be seen to be partly opened. Removal was accomplished without difficulty by pushing the end of the tube down while the forceps and tack were brought upward. When the tube met with the head of the tack they were both withdrawn. No ill effects were experiencd from the operation which was done without anesthesia.

Discussion.

Dr. R. Clyde Lynch, New Orleans: I would like to mention a case of a nail in the stem bronchus to the lower lobe of the right lung, in which I employed fluoroscopic bronchoscopy, in the following way. I had constructed a canvas cot which was placed

on two trucks, the Xray tube was placed beneath the cot and we were able then to follow the passage of the tube down the bronchus to the foreign body; to be sure the tube was in line with the foreign body we turned the patient in a lateral position and succeeded in this way in obtaining a view from this angle; forceps were passed down and were seen to engage the shank of the nail, and while the foreign body was not removed under this guidance it was a source of great satisfaction to be able to so direct one's work. The cot was made from a piece of canvas and two broom sticks. I suggest this as a practical emergency table which can be constructed with but a few moments' notice and which served me very well in the above instance.

Dr. Harmon Smith, New York City: Dr. Ingals' method of locating and extracting foreign bodies in the lungs recalls an unfortunate case, in which I was a consultant last winter.

The patient, a man of sixty-nine years, had inhaled a dental burr, consisting of an aluminum handle and steel point, which is employed by dentists for drilling the upper molar teeth and has to be used with the fingers.

During its use the dentist dropped this instrument on the patient's tongue and turned around to take up a pair of forceps to remove it, but when he looked for it the burr had disappeared. Not being able to find it he advised the patient to have an X-ray taken. Instead of doing so immediately he went to a business meeting and later in the course of the day had the X-ray taken. The radiograph showed a foreign body in the upper left lobe bronchus, well towards the distal extremity of the bronchus. He then consulted an expert bronchoscopist, who worked for over an hour, trying to extract the body, but failed. This gentleman then called me in consultation and I worked for another hour, but could not reach the burr. Then another bronchoscopist was called, who likewise failed.

Dr. Jackson was then telegraphed for. He worked an hour or more and then confesed it was beyond the reach of bronchoscopy. In consultation with an eminent sugreon it was deemed necessary to remove the foreign body surgically. This was determined on in view of the fact that the man was old, of a highly nervous temperament and was in nervous shock from the antici-

pation of the outcome. He, together with the family, insisted that the body should be removed at whtaever cost. The surgical operation was performed and the outcome was fatal.

In the effort to reach this body two fluoroscopic tubes were employed, one beneath the body and one to the side, so that in approaching it one could definitely determine the exact point of the instrument in relation to the body. But irrespective of this aid the instrument could not be induced to turn a corner sufficiently to reach the body.

One of the bronchoscopists devised an instrument which he thought would be peculiarly effective in this case, but it, too, failed of its object. This case clearly demonstrated to all of us that foreign bodies can enter the lung where it is impossible to reach them with the bronchoscope.

Dr. Thomas Hubbard, Toledo: Dr. Ingals' remarks with reference to the liability of the indiscriminate application of the fluoroscopic method of examination are very timely. In a case recently under my observation the method was tried in removing a tack from the right lung. The tube was passed too far. A very skilful fluoroscopist was assisting, the operation was prolonged for some time, and every effort made to extract the tack, but it had been impacted by the method. I found it crosswise in lower bronchus, and had to turn it by means of a hook before it could be extracted.

There is always danger to the fluoroscopist in these prolonged operations, and also some danger to the patient.

Dr. John F. Barnhill, Indianapolis: I would like to ask Dr. Ingals to state his method of watching the end of the fluoroscopic forceps,—whether an assistant, the fluoroscopist, or he himself watches the end of the instrument; also whether there is any danger of grasping the lung in getting through a spot where there is an abscess.

In the lay press, in all accounts of foreign bodies getting into the lung, the writer always says the patient *swallowed* a foreign body. Dr. Richards used the same term in his paper. Is it not aspirated or inspired?

Dr. William E. Casselberry, Chicago: I would like to ask Dr. Ingals about the arrangement of the operating table with

respect to a combined bronchoscopic and fluoroscopic technique and what position the operator takes at once to view the image and manipulate the forceps and bronchoscopic tube.

Dr. Smith, continuing discussion: It was advised to wait in the case which I mentioned. The majority of the consultants wanted to wait, but Dr. Jackson said pneumonia might result. The matter was put up to the family, and they said operate by all means. The man was in such a nervous state it was thought he would die anyway. The head was bent over as far as the man's neck would allow, and it was determined that tracheotomy would offer no further aid. Dr. Jackson has recently read a paper in Brooklyn on the limitations of bronchoscopy.

Dr. Ingals, closing the discussion: Dr. Richards spoke of the tack itself coming away piecemeal, or having been oxidized. I had an experience with a much larger nail which had been in a boy's lung for eight years. It appeared in the radiagraph two or three times larger than it really was. I got nothing but the head; the rest came up in a lot of thick black fluid.

I watch the forceps myself after it has reached the vicinity of the foreign body.

It is on account of the danger of puncturing the lung that I caution gentleness. If one uses much force it is easy to puncture the lung, but it is not at all necessary.

I understand the danger of prolonged fluoroscopy, and that is why I think one should always have an expert radiographist to manage the light. The light should be turned on for only a few minutes at a time. The operation should not be prolonged excessively.

I use specially arranged tables so that the light can be placed wherever I wish it. Sometimes it is necessary to have a board raised about four inches above the table so that the patient's head may hang down over the end of this board; when it could not hang over the end of the table.

This method should not be employed for every patient with a foreign body in the lungs, but as the last resort. The foreign body should usually be found and removed by other methods, but it is an extremely valuable method in the classes of cases that I have cited. I think that in most cases of stricture this would

be much quicker and better than to spend time to dilate the stricture first.

As to the duration of the operation, one might well adopt the rule that one hour should be the limit. Ordinarily a half hour is sufficient. If the patient is in good condition one may keep on for an hour; and later try again some other day. It is better to let the patient live with the foreign body in the lung than to keep on too long with a single operation. Many patients live for eight or ten years with foreign bodies in their lungs. Therefore it is better to wait and give the patient a chance than to do a thoracotomy. The probabilities are that a foreign body in the upper lobe will settle down after a time where it can be more easily reached.

Dr. Richards, closing the discussion: The question arises in connection with these foreign bodies, how long and how much we are justified in searching for them. Dr. Smith's case calls to mind a case in which an attempt was made to remove a small gold pin of the safety-pin variety. The patient was a young woman. Killian, before a committee of medical men, worked for an hour or more and failed. Later in the same summer Dr. Jackson tried to remove the same gold pin at the Rhode Island Hospital. He worked about an hour and a half, and gave it up. The girl went into the hospital as a patient, remained as a pupil nurse for two and a half years, and graduated. So far as I know she has never had any pain from that pin. It is a question sometimes whether we should not wait for more definite symptomatology. I think in Dr. Smith's case if they had waited the man might be alive to-day.

LEUCOPLAKIA BUCCALIS ET LINGUALIS.

BY ROBERT LEVY, M.D.

The interest attached to a study of leucoplakia lies in the fact that the essentials leading to a practical understanding of the subject have been for many years and still are unsettled. In the Transactions of this Association there will be found three papers dealing with the subject. The paper by Ingals in 1885 was very comprehensive. He stated that he had found about fifty articles on the subject and presented an excellent bibliography up to date. Glasgow in 1887 reported a case in the proceedings of this association. The diagnosis in this report is open to question. Cobb's paper in 1902 presented a most excellent study of histological findings. His bibliography supplemented that of Ingals'.

The subject is no less interesting because of the enormous literature and the varied opinions that have been presented. Disputed points as to etiology and the question of malignancy, as also the unsatisfactory results of treatment, are further evidences of the unsettled state of our knowledge.

This essay is intended to review the bibliography from the date of Cobb's paper in 1902 to the present time, and to offer a critical analysis of opposing views so as to clarify somewhat if possible the atmosphere. For this purpose the following case is used as a text:

Mr. R. T. has been under observation more or less continuously for a period of seven years. When he first presented himself he was sixty-three years of age, and with the exception of asthma and an attack of "brain fever" gave no history of previous illness. He did not use tobacco and denied syphilis. One brother had died, presumably of cancer of the stomach.

Approximately twelve months before his application for treatment and immediately following the extraction of a tooth he first noticed a feeling of soreness in his mouth. This was followed by the appearance of white ulcerations attended with pain.

Upon examination the mucous membrane on the right side of

Fig. 1.

Fig. 2.

the mouth and that covering the gums of the lower jaw, where there were no teeth, was found covered with plaques of irregular outline, thick in some portions and thin in others, presenting a bluish white or yellowish white color with superficial excoriations seen especially at the margins. (Fig. 1.)

The picture was that of leucoplakia, although less typical than is often seen, and an attempt was made to explain its irregularities by bacteriological examination. This proved unsatisfactory in that one bacteriologist was able to demonstrate among other bacteria the fusiform bacilli and the spirilla which lead him to report Vincent's Angina, while the other found an abundant flora of micro organisms growing, as he believed, in soil of lowered resistance.

The patient remained under observation nearly two years, but was not improved by treatment. He then consulted a surgeon, who later reported the following:

"A nodular, spongy, indurated mass was found involving the alveolar process at the right angle of the jaw. The mucous membrane of the right cheek, the right pillars, the right border of the tongue and the mucous membrane of the alveolar process of the right inferior maxilla were covered with extensive patches of leucoplakia. The glands of the neck were not enlarged. A microscopic examination resulted in the diagnosis of carcinoma, although the details of this examination were not noted.

"Some improvement took place under potassium iodid and tonics in addition to local applications of the Paquelin cautery and daily irrigations of potassium permanganate solutions. This improvement did not continue in spite of repeated cauterizations and therefore, after ligation of the right common carotid, the right half of the inferior maxilla was resected. The growth had extended into the muscles at the angle of the jaw which were removed together with the parotid gland. Dissection of the growth after operation showed a fungoid mass near the angle of the jaw about the size of an egg. Recovery was prompt and upon his discharge from the hospital there were no remaining areas of leucoplakia."

"The patient now remained well for about three years, at the end of which time he noticed a return of the white spot, with

tumor. Examination at this time showed a papilloma springing from the angle of the right lower and upper lip close to but not involving the cutaneous junction. Within the mouth the mucous membrane of the right side was covered with a large papillomatous mass, the surface of which presented thickened plaques of leucoplakia which spread gradually to the surrounding normal mucous membrane." (Fig. 2.)

The growth upon the lip was removed and sectioned, the pathologist, Dr. Hillkowitz, reporting as follows:

"Section from the growth in the buccal cavity of Mr. T. reveals an over-growth of epithelium which is enormously thickened throughout all its layers. The horny layer is over-developed and dips down between the numerous infoldings of the epithelium which grows in papillary form. The basal layer is well defined and there is no evidence of atypical proliferation nor other signs of malignancy. The submucous structure is quite vascular but presents no other abnormalities. The appearance of the neoplasm under low magnification is that of a cauliflower. Pathologic diagnosis, papilloma. (Figs. 3 and 4.)

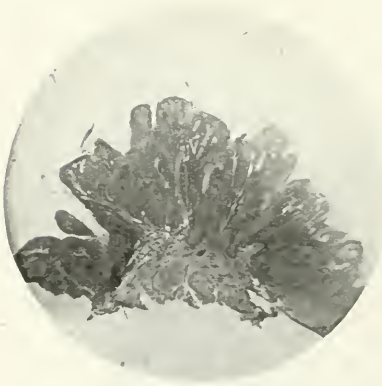


Fig. 3.

Fig. 4.

It is one year since the tumor from the lip was removed. There is no evidence of recurrence. The tumor in the mouth is under treatment by fulguration which up to the present time has diminished the size of the growth as well as the extent of the leucopla-

kia, but owing to the pain connected with the treatment the patient declines to continue."

The above history relates clinically and pathologically the various phases through which, at some time or other, cases of this kind pass.

Names, Definitions and Varieties. The term leucoplakia, although a convenient one, is unfortunate in that it is rather generic than specific.

Goodale speaks of it as a term applicable to all white dyskeratoses.

Gaucher defines it as white plaques varying in size, somewhat indurated superficially and occasionally accompanied by fissures or ulcerations.

Joseph says leucoplakia is a primary lesion of the tongue and mucous membrane of the cheek upon which appear spontaneous blue white spots in place of the normal mucous membrane.

According to Shoemaker leucoplakia appears to be essentially a chronic inflammation of the mucous membrane with infiltration, localized cellular hyperplasia and keratinization of the epithelial layer.

Marie speaks of leucoplakia as leucokeratosis, that is the transformation of a squamous epithelium into a thick horny epidermis.

Castells maintains that there are at least two varieties of leucoplakia other than those dependent upon syphilis which are known as Wilson's lichen and psoriasis buccalis

Mollenes points out the following varieties:

Idiopathic essential leucokeratoses,
Syphilitic leucokeratoses,
Arthritic leucokeratoses,
Leucokeratoses of smokers, of glass blowers and of those wearing dental plates, etc.
Mixed leucokeratoses.

Sabourand describes two forms, the para-syphilitic and the genuine, the latter being much less frequent.

Lacapere speaks of a form due to hereditary syphilis which may be distinguished by certain characteristics, namely the entire appearance of the lesion is suggestive of a very old affection as

shown by the grey color due to the desquamation of the epithelium, the plaques themselves are retracted and compressed like old cicatricies.

Among other names by which this disease has been described are, *psoriasis buccalis* introduced in 1868 by Bazin, *plaque de fumeurs* introduced in 1858 by Buzenet, *tylosis, keratosis lingualis* and *ichthyosis;* Butlin prefers the term *leucoma*, as does Beffel, who considers it not simply a chronic inflammatory process but a heteroplastic one.

Leucoplakia has been described involving other organs besides the cheeks and tongue.

A case reported by Farrel involved the pillars, the tonsil, the epiglottis and the arytenoids. In this case the diagnosis was doubtful, but Bosworth identified it as leucoplakia.

Barker found that it occurred on the prepuce, anus and other regions that do not come in contact with tobacco or smoke.

Butlin reported its occurrence on the vulva and Jayle and Bender found cases of leucoplakia involving the vulva, vagina and uterus. A case of leucoplakia of the uterus was reported by Sweeney, and Löhnberg found carcinoma with leucoplakia of that portion of the female genitals covered with mucous membrane.

Lecene studied a case of leucoplakia involving the pelvis of the kidney.

Etiology. In some individuals the mucous membrane of the mouth is more susceptible to exposure and irritants than in others, which explains its more frequent occurrence in these cases. This excessive vulnerability of the buccal and lingual mucosa has been the cause of much confusion in the etiology, white patches being observed in every instance so that syphilitic scars, chronic superficial glossitis or any of the keratoses mentioned may be held responsible.

The two etiological factors most frequently discussed in their relation to this disease are syphilis and tobacco. Great difference of opinion prevails, based, it would appear, upon individual experience.

Syphilis. Kopp states that leucoplakia is a pathognomonic sign of syphilis.

Gaucher believes leucoplakia is always syphilitic.

Landouzy gives his opinion as follows:

First, that the indispensible factor is syphilis.

Second, that the use of tobacco is a valuable contributing agency in the production of leucoplasia, but is not essential.

He has seen many cases where the history was negative as to the use of tobacco but he has yet to see one where syphilis did not play the most important part.

Kaposi, quoted by Lublinski, states that "keratosis mucosae" is the result of syphilis.

Merklen ascribes it to hereditary syphilis, in children.

Tobacco. Joseph gives this as the most important cause. He states that he never saw a case that had not been a heavy smoker. He believes it has nothing to do with syphilis except that the latter, as other local lesions, offers a predisposing cause for the development of leucoplakia in smokers.

Between these two views we find many who ascribe the affection to both syphilis and tobacco, but who find one rather more important than the other.

Dubeuille believes leucoplakia is always associated with syphilis and almost always with the use of tobacco.

Bockart speaks of the disease as para-syphilitic and says that both syphilis and tobacco are equally important in its production. He has never seen leucoplasia in syphilitics who have not been smokers nor in smokers who have not had syphilis.

Erb assumes some cases to have been syphilitic. He believes that both syphilis and smoking are causative factors, smoking causing it alone when excessive, but in the presence of syphilis the moderate use of tobacco may produce it.

Butlin believes tobacco and syphilis as well as alcohol are only exciting causes, the predisposing cause being found in a sensitive mucous membrane. In a subsequent paper he reported cases involving the vulva from which he concluded that "there is reason to believe that the disease here is the same as in the mouth and if so the influence of tobacco and alcoholics in its production loses some of its importance."

Goodale ascribes the disease to syphilis and smoking, the use of the latter being more important if syphilis exists.

Guerini states that when leucoplakia is due to syphilis it oc-

curs on the tongue, when due to tobacco it occurs on the lips or cheeks.

Hartzell states that smoking and syphilis are not so frequently the cause as is believed. He considers it in the beginning an inflammatory disease of some special character for he finds it upon other mucous surfaces adjoining the skin.

Toussiant describes it as due to trophic nerve lesions, being "pretabetique," because of the symmetry of the lesion. This naturally pre-supposes a para-syphilitic affection.

Queyrat and Bouttier show that it undoubtedly exists without the pre-existence of syphilis, by the report of a case occuring in the presence of a chancre of the lip.

Those who believe tobacco an important cause find that it occurs in smokers although instances in which the disease is produced by the contact of tobacco against the mucous membrane as in chewing are recorded.

Lieven, however, believes that the reason it occurs in smokers is not because of the tobacco but because the suction during the act of smoking draws the mucous membrane of the cheek between the teeth. He therefore lays stress upon this mechanical act as the underlying cause.

The history of the large majority of my patients was clearly opposed to either syphilis or tobacco as a cause.

Pathology. Although as Cobb states, much had been written upon this subject, not many had carefully studied microscopic conditions, nevertheless since the appearance of his paper a great deal of space has been devoted to the histology of the affection.

The different phases of leucoplakia have been variously described.

Barker divides the pathology into three stages:

First stage. In this there is a slight thickening of the epithelial covering of the papillae.

Second stage. Here is found a greater thickening of the epithelium, the cells having undergone horny change and an exudation of leucocytes being found in the papillary layer.

Third stage. In this stage the plaques are very thick, the epithelium is more horny; the papillae having atrophied their place is taken by partly organized inflammatory exudate which

means that the area involved has become the seat of a chronic superficial inflammation.

Gaucher's view agrees with Barker's. He states that anatomically leucoplakia is very similar to superficial sclerotic glossitis, the sclerosis being especially marked in the papillary layer. The original lesion is epithelial and consists in "cutization" of the mucosa.

The term "cutization" was also used by Lecene to characterize the changes that occurred in a case involving the pelvis of the kidney.

The term tylosis having been applied to cases of leucoplakia, Rosenheim made a comparative study of the histological changes in leucokeratosis buccalis as compared with tylosis of the palms and soles. He found the essential changes were very much alike except that in leucoplakia the infiltration of corium with round cells was more marked and the tissue more embryonal in appearance.

Beffel considers leucoplakia a benign epithelial growth which confines its operations externally to the basement membrane. As the disease progresses Beffel finds that it may and not infrequently does violate the basement membrane invading the underlying connective tissue, thus becoming an epithelioma.

Shoemaker states that in the last course of the disease papillomatous growths may develop from the affected locality, while Vilanova speaks of two forms of degeneration, one the papillomatous, which is benign, the other epitheliomatous, which is malignant.

The histological changes that occur early in the development of papillomatous growths are well illustrated in the accompanying photomicrograph taken from one of my cases. (Fig. 5.) Dr. Hillkowitz describes the microscopic findings as follows :

"The epithelium is considerably thickened and there is a tendency to keratinization of the upper strata. The horny layer occasionally dips down in the stratum germinativum in the form of spherical masses. The epithelium shows invaginations along its surface producing a wavy appearance and suggesting the beginning of papillomatous growth.

"The papillae are long and narrow and heavily infiltrated with

small round cells which also invade the submucosa immediately adjacent to the epithelium, indicating inflammation of the papillae and neighboring region. The small round cells occasionally force their way to the surface where there is a defect of the

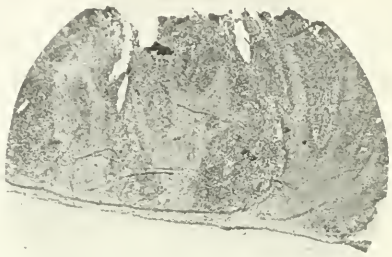


Fig. 5.

epithelial lining. This is seen at the site of the invaginations above mentioned."

Frequency of Cancer. No one denies the development of malignant growths in connection with leucoplakia. Whether this invariably occurs in the course of time, or whether it is a direct consequence of leucoplasia or merely a coincidence, are questions which have been and still are matters of dispute. The importance of this question can not be over estimated.

Klop states that the question of leucoplakia as a precancerous stage can not at present with our knowledge of the genesis of cancer be answered with precision, nevertheless as Joseph says, "this spectre stands in the background of every case of leucoplakia." He believes we must always fear carcinoma. It may take from twenty or thirty years to develop. Still this author believes we must not be too pessimistic.

Barnard states that a leucoplakia often degenerates into cancer, which seems to be its ultimate goal.

Morestin says that leucoplakia is always a prelude to cancer. When involving the tongue it has an especially gloomy outlook

because it degenerates into epithelioma more frequently, more constantly and earlier than do leucoplakias elsewhere.

Löhnberg quotes Jayle and Bender to the effect that every spot of leucoplakia is suspicious.

Mantilla believes leucoplakia and epithelioma must no longer be considered a coincidence. He gives a table of eleven observers with 556 cases in which 158 or 31% developed epithelioma.

The percentage of these occurrences according to other authors shows considerable variation.

VanderSpek believes that epitheliomatous degeneration occurs in 22%.

Artelli finds it in at least 30%, Marie in from 7 to 50%, Guerini in 20%.

Herzfeld finds 22% resulting in cancer owing to the long continued leucoplakia which prepares the soil for the malignant growth.

Jayle and Bender give the percentage as high as 50. They think leucoplakia offers most excellent opportunity for cancer. In addition pathologists disagree as to the genesis of malignant growths although the microscope has been one of our greatest aids in diagnosis.

Hartzell believes the number of cancers under estimated rather than over estimated. On the other hand Kopp makes the distinction that instead of being pre-cancerous, leucoplakia represents the first stage of true epithelioma, while Guszman says that no one can state with any degree of certainty that leucoplakia is a pre-cancerous stage of some definite pathologic entity nor even that leucoplakia is more prone to degenerate into epithelioma than any other place which has been the seat of a chronic long-standing irritation.

Barker takes a most reasonable view of the situation. He says, "it is nearer the mark to say that in those who are predisposed to carcinoma by birth or surroundings, leucoplakia offers its most suitable soil." As to its being the direct cause of the cancer, he affirms that "on the whole it appears to me that the very pessimistic views held in some quarters as to the inevitable transition of leucoplakia into carcinoma, have perhaps been over

done. It is a condition to be watched carefully and one which justly excites uneasiness, but it is another thing to take it for granted that it is always the precursor of cancer, and to attack it at once by wide reaching excision of the part itself and of the glands likely to be involved."

Pathological Manifestations Indicating Development of Carcinoma. Were it possible to determine early enough cellular changes leading to the development of cancer we might prevent its occurrence. It would seem that the exact time of the development of epithelioma is uncertain and much confusion has arisen by the terms "pre-cancerous stage" and "malignant degeneration," terms which have been handed down as matters of tradition, giving rise to various views which still further add to the confusion.

The manner in which epithelioma follows the presence of leucoplakia has been carefully studied by many authors. A few of the most prevalent views are here presented with a critical analysis of the same for which I am indebted to Dr. Philip Hillkowitz of Denver.

Barker states that "under the horny layer the proliferation of the younger cells takes place and if they can not be thrown off they must, as it were, bury under the papillary stratum, and this is just what we see under the old white patch when under the horny covering a cancerous nodule is beginning to form."

Hillkowitz states that this hypothesis must be rejected on the ground, first, that the horny layer can not hold the growing cells back. In the formation of papillomata, verrucae, condolymata, accuminata, etc., there is also proliferation of the epithelium which grows upward, pushing the horny layer in front of them and forming numerous folds on the surface as a result of the excessive growth. Second, mere proliferation of epithelium is not sufficient cause for the production of an epithelioma. Third, the connective tissue of the submucosa or the corium can certainly resist the invading epithelium much better than the horny layer.

Shoemaker says it is easy to see why there should be frequent developments of epithelioma. The pathological history of leucoplakia shows us a hyperkeratosis with a downward growth of

the rete-mucosa and an epithelial increase of the inter papillary space thus obliterating the papilla. This is a microscopic picture of tubular epithelioma with superficial degeneration to the interference of the circulation.

The criticism here is that the obliteration of the papillae is not yet a sign of epithelioma nor a predisposing factor. Injections of scarlet red into the skin of the ear of rabbits produce even a worse picture, one that is very similar to epithelioma, yet the destructive process is lacking.

Vilanova states there are essentially two ways in which an epithelioma may develop from leucoplakia:

> First, the most frequent way is one in which there is a progressing desquamation and dekeratinization of cells and a subsequent "epitheliazation" of ulcerations and fissures at the points of such dekeratinization.

Second, the one where the epithelioma develops directly from "epidermic globes" beginning in the horny cells.

As to this view it has been shown by Ribbert that contrary to the formerly accepted belief that a skin cancer originates from the offshoots and prolongations that the epithelium sends down into the cutis, the new growth arises from a circumscribed center, that is a misplaced embryonic or post natal inclusion which grows toward the healthy epithelium fusing with the latter and thus producing the illusion that it is the original epithelium that grew downward into the subjacent layers. Cancer cells starting from their point of origin with a reproductive power that is limitless, destroy everything in their course, both connective tissue and healthy epithelium, filling the space previously occupied by them with their own progeny. It must be again emphasized that the normal epithelial cell does not become carcinomatous. Every tumor cell is derived from a pre-existing tumor cell back to the original germinating center; hence the origin of tumor cells from "epidermic globes" is meaningless.

Mantilla gives Leloir credit for the first classical description of epitheliomatous degeneration of leucoplakia. According to Leloir the process is as follows:

The epithelioma never begins at the level of hyperkeratinized surfaces; as a rule, the degeneration begins either at the ulcer-

ated surface or more commonly at a fissure, the entire process consisting of four stages:

1. Leucoplakia with hyperkeratinization.
2. Desquamation, ulceration, and fissure formation.
3. Irritative lesions with dekeratinization.
4. Epitheliomatazation of dekeratinized regions at the level of the stratum Malpighii.

At the point of junction of the dekeratinized areas and the beginning of epitheliomatous degeneration there are neither the stratum corneum, nor the stratum granulosum, the process being one of invagination.

Leloir essays to trace the various stages leading from leucoplakia to epithelioma dividing the process arbitrarily into four pictures. He has undoubtedly seen the different pictures of the disease in different individuals but it is questionable whether there is always a causal connection between them.

In his second stage there is ulceration and in the last epithelioma formation.

This brings up the relation of trauma to cancer a problem that has not yet been solved. No one can deny the frequent occurrence of cancer in spots subject to long continued irritation; for example, ulcer of the stomach, smokers' cancer, that of chimney sweeps, betel nut chewers, etc. Yet all ulcers of the stomach do not develop into cancer. No one has yet succeeded in producing cancer experimentally in animals by trauma. All that can be said at the present time is that it is a predisposing cause.

All cases of leucoplakia therefore need not necessarily end in epithelioma.

Milian states "we do not know the reasons why leucoplasia develops so frequently into epithelioma." He is inclined to think that we are dealing with a biologic change, that is, when an epitheliomatous cell becomes leucoplased its function becomes altered and as a result an abnormal stimulus to excessive reproduction occurs.

Hillkowitz says the question of biologic change in the cell leading to increased proliferating tendencies is still shrouded in darkness. Some hold that irritation produces a formative change in the cell, that is, a tendency to reproduce—a view originally

enunciated by Virchow. Others like Weigert and Ribbert assert that irritation rather tends to destruction and necrosis. Ribbert ascribes the increased proliferation of tumor cells to lack of resistance on the part of the connective tissue. Recent studies in the chemical pathology of the cancer cell are of great interest, but shed little light on the subject under discussion.

Gaucher affirms that the presence of what he calls "epidemic globes" determines the tendency of these leucoplakias to become epitheliomata. There are three stages in the evolution:

1st. Here are seen white plaques, usually on the dorsal surface and borders of the tongue.

2d. Then comes the stage of the sclerotic changes, with desquamation of the superficial, keratinized epithelium. Here also we see the development of the vegetating papillomata.

3d. This third stage supervenes if the papillomata are to become epitheliomata.

The presence of "epidermic globes" is probably the beginning of a malignant growth, but it is questionable whether there exists an intermediate stage of papillomatous formation. It is probable though not proven that if cancer is to develop on the site of leucoplakia it is cancer from the beginning.

Joseph determined that the submucous tissue in the papillary layer close under the rete gives one the impression as if the elastic tissue is very greatly rarefied and in some cases even absent, and state, "no wonder if on this account the resistance has disappeared and an atypical epitheliomatous infiltration thus easily obtains a footing in the connective tissue." The result is the development of cancer.

This explanation accords with Ribbert's view of lessened resistance of connective tissue, thus favoring the growth of cancer.

Clinical Manifestations Indicating Cancer.—The fear that a given case of leucoplakia may at any time eventuate in cancer and the disposition to give an unfavorable prognosis upon the first indication of malignancy make it incumbent upon us as clinicians to determine as early as possible the advent of warning signs. Although clinical manifestations can not be considered positive without the confirmatory evidence of the microscope,

nevertheless they should always be considered in connection with laboratory findings.

Marie gives the manifestations which point to malignant degeneration as pain radiating into the ears, enlargement of submaxillary glands, induration of the plaques and a slow development.

Jayle and Bender point to the fact that cancer develops insidiously, usually starting from the level of the fissures. The plaques are found to be white, parchment-like, hard and indurated.

According to Barnard the signs of this terrible finale to leucoplakia are:

1. Wart,
2. An ulcer or ulcerated fissure,
3. A nodule.

Reclus states that one can recognize an epithelioma developing from a pre-existing leucoplakia without much difficulty if he is careful enough to bear in mind the following points:

1. Such epitheliomata are small, elliptical or oval in shape, have an indurated base with desquamation of superficial epithelium leading to ulceration.

2. In the recurrence of such an epithelioma, the new focus is situated not in the same plaque but in another one, even in a different organ. That is if an epithelioma which originated in a plaque on the tongue, were removed, it might recur in a plaque on the lip.

3. A decided lack of malignancy.
4. The absence of adenitis.

Treatment—That the treatment for this disease is unsatisfactory is to be expected when we consider the unsettled state of our knowledge concerning its etiology. Every author recommends a line of remedial agents according to his particular view of the underlying cause. Nevertheless but few favorable results are reported.

Dittrich has been able to effect a cure by deep destruction with the actual cautery.

Sabourand also advises cautery, believing it to be the only

adequate method of treatment. According to this author the galvano cautery always gives perfect cure. He cautions, however, that this should be applied not too deeply nor too superficially.

Many authors resort to surgical intervention. Among these are found Marie, Mollenes and Trepenard.

Vilanova removes the plaques with bistoury or radio therapy.

Freudenthal has also used radium, but with indifferent results.

Morestin advises an extensive surgical procedure described as "decortication."

Anti-syphillitic treatment is recommended of course by those who believe the disease dependent upon syphilis.

Gaucher and Barber report two cases in women whose husbands were syphilitic. These cases were cured by mercury.

Merklen's two cases cured by mercury were children suffering from hereditary syphilis.

Milian, Gaucher and Trepenard are all enthusiastic adherents of mercurial treatment, recommending injections of insoluble salts of mercury.

All authors are agreed as to the importance of oral hygiene, unirritating mouth washes such as solutions of sodium chloride and the removal of all sources of local irritation. Special formulas for washes, ointments, etc., are given by Butlin, Vander Spek, Barnard, Avierinos, Vilanova, Shoemaker, Fare and others.

The X-ray has been favorably commented upon by Haremaker, who cured a case after six months' treatment, other measures having failed.

Stein, however, reports failure from this treatment, the patient eventually dying from a malignant growth.

Considerable interest has been manifested in the treatment by the high-frequency current. Bruniquel used this method in ten cases, including the simplest form, the beginning of epitheliomatous change and papillomatous plaques. Six cases of simple leucoplakia were permanently cured.

This method of treatment has been carried out at my suggestion by Dr. O. M. Shere of Denver in a sufficient number of cases to warrant the belief that it is of real value, and in the light of our present unsuccessful therapy it may be recommended as offering distinct advantages.

CONCLUSIONS.

1. Leucoplakia is of special interest because of its doubtful etiology and because of the dispute regarding its degeneration into epithelioma.

2. The case reported shows the uncertainty of the diagnosis of malignancy. The most definite clinical appearance can not always be relied upon.

3. Leucoplakia is a generic term. Excluding syphilitic lesions it may be considered a pathologic entity.

4. The views of writers who attempt to show the degeneration into cancer are not tenable in the light of our present understanding of the genesis of cancer. Degeneration of existing cells into cancer cells does not take place. A cancer is such from the beginning and is not caused, only influenced, in its development, by irritative lesions.

5. Our understanding of leucoplakia has been confused by attempts to describe a pre-cancerous stage or to establish the theory of its degeneration into a malignant growth. Leucoplakia may however be looked upon as a warning.

6. Certain clinical manifestations may arise which, though not positive, are sufficient to arouse the suspicion of malignancy.

7. The results of treatment are unsatisfactory. Fulguration offers considerable encouragement.

Bibliography.

Artelli. La degnerazione epiteliale della leucocheratosi. Arch. Ital. di Otol., Rhinol., e Laringol., 1913.

Aviernos. Traitement de la leukokeratose bucco linguale. Marseille Medicale, Vol. 49, 1912.

Barnard. A case of Leucoplakia in a woman, who was not a smoker nor suffered from syphilis. Polyclin., Lond., 1904.

Beffel. The Chicago Clinic, Apr., 1902.

Bockhart. Uber die Behandlung der Leucoplakia Bucco—Lingualis. Monatsheft f. Prackt. Dermat., Hamb., 1902.

Bruck. Diseases of the Nose, Mouth, Pharynx and Larynx. 1910.

Bruniquel. L'etincelle se haute frequence dans le traitement de la Leucoplasie. These., Toulouse. 1911.

Butlin. Diseases of the Tongue. 1900.

Butlin. Leucoma or Leucoplakia of the Vulva and Cancer. Brit. Med. Journal July 13, 1901.
Castells. Relaciones de la leucoplasia buccal con la siflis. Revista de Med. y. Cir. prac., 1907.
Chambers. The Diagnosis and Treatment of Pre-cancerous Lesions, etc. Dominion Med. Monthly, Feb., 1915.
Chevassu. Leucoplasie, buccale. Bull. de Societe Anatomique, 1903.
Cobb. Leucoplakia. Trans. American Laryngological Association, 1902.
Coquet. Leucoplasie Buccal. An. de san military Buenos Aires, 1904.
R. H. Craig. Hyperkeratosis lingual. Trans. American L. R. & O. Society, 1908.
J. Darier. Leucoplasie et cancer. Presse Medicale, 1903.
Del Vecchio. Contributo clinico allo studio della etiologia della leucoplasie. La Clin. Mod., Firenze, 1906.
Dittrich. Journal Cutaneous Diseases, 1911.
Dubreuille. Leukokeratoses de la langue. Jour. de Med. de Bordeaux, 1907.
Englisch. Ueber Leucoplakie und Malakoplakie. Zeitschr. f. Urol. 1907.
Fare. Leucoplasie et son traitement. An. Med. Chir. du centre, Tours, 1903.
Freudenthal. The Treatment of Leucoplakia by Radium. Laryngscope, 1906.
Gaucher et Barbe. Leucoplasie linguale dans la syphilis conceptionelle. Bull. de la Soc. francaise de Dermat. et de Symp., 1901.
Gaucher. La leucoplasie linguale. Presse Medicale, 1913.
Glasgow. A Case of Leucoplakia Buccalis. Trans. American Laryngological Association, 1887.
Goodale. Leucoplakia. Annals of Otology, Rhinology and Laryngology, 1900.
Guerini. La leucoplasia Boccale. Adonto-stomatol, Napoli, 1903.
Guerrin. Traitement de la leucoplasie, par le 606. These, Paris, 1911.
Guszman. Die Leucoplakie der Schleimhaut der Mundhöhle. Orvosi, Hetilap., 1908.
Haremaker. Een geval van psoriasis lingual behandelt. met Röntgenstralen. Eydschr. v. Phys. therapie ew hygiene, 1904.
Hartzell. Trans. College of Physicians of Philadelphia, 1906.
Herzfeld. Leucoplakia u. Carcinom. Dermat. Centralbl., 1908.

Ingals. Leucoplakia Buccalis et Lingualis. Trans. American Laryngological Association, 1885.

Ivy. N. Y. Medical Journal, Apr. 13th, 1912.

Jayle et Bender. La Leucoplasie de la vulva, vagie et de l'uterus. Revue de Gyn., Paris, 1905.

Joseph. Deutsch. Med. Woch., No. 34, 1906.

Kopp. Zur Frage der Natur u. Behandlung der Leucoplakie. Arch. f. Dermat. Wien, 1907.

Kronenberg. Handbuch der Speziellen Chir. des Ohres u. der oberen Luftwege. Bd. 11, No. 3, 1914.

Lacapere. Leucoplasie linguale heredo—syph. Bull. de la Soc. Med. des hop., 1908.

Landouzy. Valeur semiologique des leucoplasies jugales et commisurales dites "plaquer des fumeurs." Presse Medicale, Paris, 1908.

Landouzy. Importance diagnostique de la leucoplasie Buccale. Jour. de med. clin. prat., Paris, 1909.

Lecene. Pelvis. Cas de leucoplasie du bassinet. Journal d'Urologie, Paris, 1913.

Lieven. Leucoplakia Buccalis. Ref. Centralblatt für Laryngologie und Rhinologie. 1901.

Löhnberg. Zeitsch. Geburtsh. 1913.

Lublinski. Ueber das Verhaltnis der Leucoplakia zur Syph., Deutsch. Med. Woch., No. 21, 1904.

Lydston. Pre-cancerous lesions, etc. Journal of Surgery, Feb., 1915.

Maue. De la leucoplasie bucco-linguale. Odontologie, Paris, 1902.

Merklen. Sclerosis and leukoplakia of the tongue from inherited syphilis in two brothers. Bull. de la Societe de Pediatric, Paris, 1911.

Milian. La leucoplasie. Gazette des hopitaux. Paris, 1906.

Milian. Diagnostic et traitement de la leucoplasie. Rev. des hopitaux de France. No. 4, Paris, 1907.

Montgomery. Leucoplasia in Secondary Syphilis. N. Y. Med. Record, 1903.

Morestin. Leucoplasie traitee par le decortication. Bull. de la Soc. Franc. de dermat. Paris, 1908.

Morestin. Traitement de la leucoplasie linguale. Bull. de la Soc. Chirugie, 1908.

Mut. Sobre la leucoplasia. Riv. ibero-americana, Madrid, 1908.

Nielson. Hyperkeratosis centrifuga (orokeratosis) pro-labi et Mucosae oris. (Duosk dermat Selskab), Hospitals Tidende, 1902.

Nielson. Ausgebreitete leukoplasie form affektion verschiedener Schleimhaute, Monatsch. f. Prakt. Dermat., Hamb., 1910.
Oppenheim. Psoriasis vulgaris des Mundschleimhaut. ref. Centralbl. für Laryngologie und Rhinologie Bd. 20, 1904.
Queyrat et Bouttier. Leucoplasie commissurale sans pre-existance de syphilis. Bull. de la Soc. medicale des hopitaux. ref. Intern. Centr. f. L. u. R., 1913.
Reclus. Les epitheliomes en surface des mugueuses leucoplasiques. Presse Med., Paris, 1905.
Rosenheim. Two cases of Leucokeratosis Buccalis. Johns Hopkins Medical Bulletin, 1904.
Sabourand. Ref. Journal of Cutaneous Diseases, Vol. 31, 1913.
Shoemaker. N. Y. Med. Journal, Nov. 23, 1901.
Shoemaker. Leucoplakia lingualis, Canada J. of Med. and Surg., 1908.
Stancanelli. Leucoplasia. Orale in individuo immune da sifilde e da tabagismo. Gior. internaz. d. sc. Med., Napoli, 1909.
Stein. Leucoplakia buccalis with report of a case treated with X-ray. Transactions American L. R. and O. Society, 1902.
Stellwagon. Diseases of the Skin. 1914.
Sweeney. Journal of Obstetrics. Vol. 68, 1913.
Toussaint. La leucoplasie bucco-linguale pretabetique. Rev. Gen. de clin. et de therap., Paris, 1894.
Trapenard. Rapports de la leucoplasie buccale et de la syphilis. These de Paris, 1905.
J. Van der Spek. Psoriasis mucosae oris et lingual. Medisch. Weekblad, 1901.
Vilanova. Estudio clinico de la leucoplacia buccalis. Revis. de Medic. y Cirug. Practic., 1901.
Weir. Ichthyosis of the Tongue and Vulva. N. Y. Med. Journal, 1875.
Zinzer. Diseases of the Mouth. 1912.

Discussion.

Dr. John F. Barnhill, Indianapolis: During the past year I have had one case of this nature. The patient, a woman thirty-two years of age, had formerly lived in Indiana, but because of tuberculosis had moved to Florida, where she had been living for four or five years. When she came to consult me she had this condition, as diagnosed by a number of physicians, pathologists, bacteriologists, general practitioners and laryngologists. She also had tonsillitis. She would not allow operation because of the

tuberculosis. She had been treated by means of X-rays, washes, etc. The mouth is now apparently well, and the patient is much better generally.

Dr. Thomas Hubbard, Toledo: I have seen many cases of this kind. There is some difficulty in establishing the diagnosis between leucoplasia and pemphigus. In one case the lesions in the throat were not typical, and had the case not gone on to typical pemphigus of the skin the diagnosis would not have been cleared up. In another case this condition occurred in a man who had syphilis. He was a heavy smoker. Another patient was also a very heavy smoker. He smoked from twenty to thirty cigars a day. After one week's cessation of smoking there was a complete disappearance of the lesion. These were typical leukoplakia lesions.

Dr. E. Fletcher Ingals, Chicago: About thirty years ago I reported a case of leukoplakia treated with the galvano-cautery, with cure.

Dr. Charles W. Richardson, Washington: The cases which I have seen have usually been so extensive that any of the operative measures suggested here or elsewhere would be entirely out of place. In the last case which I had not only the whole dorsal surface of the tongue, but the buccal cavity as well, was involved. The man had the most intense pain. He has since died. In all probability it would have developed into malignant disease. In some of my cases the dorsum of the tongue, the surface of the hard palate, and the buccal walls were involved.

Dr. D. Bryson Delavan, New York City: Most of the cases which I have seen have become malignant. Any irritative course of treatment is particularly contra-indicated. Elimination of all sources of irritation, such as tobacco smoking, must be enjoined. In view of the malignant tendency of this condition it would seem that radium would offer advantages not likely to be realized by the older forms of treatment. Cases which have already been subjected to the application of radium have improved under it. I do not know of a case, however, the matter being a recent one, in which a final cure has actually been effected.

Dr. Levy, closing the discussion: The case of tuberculosis cited by Dr. Barnhill might have been one of leucoplakia com-

plicating general tuberculosis. I have never seen leucoplakia caused by tuberculosis. If the case cited were due to this condition it was certainly remarkable. The fact that it got well is evidence to my mind that it was not due to tuberculosis. Dr. Ingals in his paper went over the subject very thoroughly. His article was the most comprehensive of any ever written up to the time of its publication.

The question of leucoplakia always terminating in cancer is of course an important one. In the full text of the paper will be found many views *pro* and *con.*

The case reported is an unusual one in view of the extent of the lesion. There have been other cases quite as extensive that have not developed malignancy. It is not absolutely necessary for such a case to terminate in cancer. In my case the lower jaw, the parotid gland and the surrounding structures were all removed yet the subsequent history of the case proved that it was not malignant. If we wait long enough we may find carcinoma developing in a patient who for years may have had leucoplakia. Given a case of leucoplakia, however, it does not follow that it must of necessity terminate in cancer. By going back far enough, in some instances as far as forty years, it is possible to find that the patient now suffering from malignant growth had leucoplakia, and while the malignant condition may have been antedated by leucoplakia this does not prove that all cases of this affection terminate in carcinoma.

Leucoplakia of the tongue is said to be more likely to terminate in malignancy than that of other organs.

TONSILLECTOMY IN THE ADULT.—ARE WE JUSTIFIED IN DOING SO MANY INDISCRIMINATE TONSILLECTOMIES FOR REMOTE INFECTIONS

BY CHARLES W. RICHARDSON, M.D.

It has been so thoroughly ingrained into the professional mind, during the past decade, that the tonsils are the source, or portal of entrance, of systemic infection, that one hesitates to direct attention to the fact that independent of the tonsils there are many other focal points which may be as guilty, if not more so than these organs in causing general infection. Indeed, the decree has become so ultra-radical, among many, that the opinion is maintained that the tonsils may not necessarily present visible evidence of disease, nor abnormal size to be a physical enemy to the system which harbors them. The small sized buried tonsils, we are told, are the greatest offenders.

The operation of tonsillectomy has become such an every day practice in the medical profession—having passed beyond the sphere of those seeming most competent to judge of its necessity and through technical experiences best qualified to perform the operation—that it seems incumbent upon us to consider some of the indications for the operations and to inquire if they are not too limitless in their scope, especially in the adult. This operation has become so popularized that even the layman considers himself competent to judge of the advisability for doing the operations and frequently presents himself to us with the statement that he has come to have his tonsils removed.

It is with a great deal of trepidation, therefore, that I make bold enough to call attention to those who have such fixed ideas with regard to tonsillar enucleation, gained from information, knowledge and experiences that there are other pregnant sources of infection which may play as important a role in general infection as innocent, though small and buried tonsils.

There seems to be a tendency to overlook such latent chronic focal centers in other portions of the body, as for example: a suppurating mastoid antrum or attic, accessory nasal cavities, the teeth, gall-bladder, appendix and seminal vesicles. The tonsils are so accessible, so easily examined, and without much search or mental effort, if appearances are against them can be so quickly condemned for removal. Indeed at times the internist or others seem to make all efforts to prove the tonsils the offending organs when the time could have been well spent in search further away but closer to the cause for infection. I am not inveighing against the removal of tonsils in adults which are hypertrophied, the seat of chronic lacunar infections, of superfical or deep-seated latent abscess, the seat of frequent acute attacks of simple or follicular tonsillitis, those which are painful in deglutition, or tender on pressure, or in which there are recurrent attacks of peritonsillar abscess. To remove tonsils in the above enumerated conditions, even though systemic infection may not be manifested is a most justifiable procedure and the elegant results, at times remarkable improvement in the well-being of the patient are ample proof of the wisdom of the operative intervention. What seems to me objectionable, and no doubt to many others, is the frequent removal of tonsils which in themselves show no macroscopic evidences of disease, and in which there has been at no previous period evidences of frequent acute pathological disturbances. That the possessor of this type of tonsils may be the subject of an infection that can not be accounted for, does not seem to justify the removal of the tonsils upon the hypothesis that possibly it is through them that the infection is brought about and maintained. It has been maintained that in acute and chronic rheumatism and in rhematoid arthritis, even though the tonsils manifest no evidences of disease, if the primary rheumatic attacks had been preceded by an invasion of acute tonsils, such evidence of the tonsils having been the portal of entrance of the infecting organism is sufficient to warrant their removal however innocent they may appear at subsequent inspections. Numerous instances could be enumerated when tonsillar enucelation has been done for the two reasons given above, wherein total failure of relief followed the operation. Indeed, in my hands, and I am sure under the ob-

servation of many of my hearers, keen disappointment has been the issue in many of the cases operated upon under this circumstance. I have observed, no doubt as many of you have, small tonsils, mere folds of tonsillar tissue between the faucial pillars which have been doomed to enucleation for no other reason than that they existed. In such individuals, at times the general health has been below the normal, or they might possess some type of mild general infection. Most cases of this type are referred to us from the internist, or come to us because they have heard that the removal of the tonsils will be the cure of all their ills. In some cases the internist, or colleague, has through pressure expressed pus from such tonsils. My experiences in this line have been limited, but I wish to chronicle the fact that in the great majority of such cases, I have failed to express pus; and in many tonsils which I have enucleated, under such circumstances, I have failed after numerous sections to even find the pathogenic surface from which pus could have been produced.

We all have noted caseous superficial and occasional deep-seated collections of caseous pus like material which has no external method of escapage. These abscesses are not very common and when present are frequently unattended with general systemic disturbances. Indeed my experience with enucleation of tonsils as the possible focal source for chronic systemic infection, wherein the tonsils evidence no marked pathological alterations, or wherein they did not evidence frequent acute disturbances, as enumerated in this paper, has not been attended, excepting in a few isolated cases with any further results than marked disappointment with regard to the improvement of the general disturbances. I have had also to pass under my observation a number of cases wherein most perfect enucleation had been performed by various colleagues,—the condition of the tonsils being unknown to me—in which the patients state that the operation had been totally resultless with regard to the general infection. In most of these cases the patients were passing on in hopes of being relieved of the faucial dryness secondary to the tonsillectomy. I could mention a number of cases which bear out this contention, but several will suffice.

A man of fifty-five, who had chronic arthritis of nearly a year's

duration, was referred to me for tonsil enucleation; fairly large, but apparently normal tonsils. No result from enucleation.

A man of fifty who traced his rheumatic infection from an acute tonsillitis four months previous to his coming under my observation. Day of operation postponed on account of acute invasion of rheumatism. Tonsils apparently healthy, moderately enlarged. Seemingly a most favorable case for relief from enucleation. No result as far as the rheumatism was concerned.

A young woman with mild general infection. Anemic with mild gastro-intestnal disturbances. Tonsils showing between pillar. No evidences of disease. As they had been suggested by several internists for removal I felt impotent in my protests. The tonsils were removed. Two years later a chronic appendix was removed with remarkable improvement.

A young married woman. General depression, and loss of flesh. No assignable cause although searching examination by internist. Moderate size, irregular tonsils. Removal advised. Wasserman double plus. Tonsils never enucleated. Under salvarsan marked improvement.

A professional friend affected for six months with joint infection. Small healthy looking tonsils. Several colleagues had expressed pus from the tonsils. I had never been able to accomplish this result. Under protest I enucleated the tonsils. No result. Four months later the seminal vesicles were operated upon with subsidence of temperature and marked improvement.

A young married woman had her tonsils enucleated two years ago to prevent infection. Two months ago she developed an enlarged cervical gland in the neck just below the jaw. Gland removed containing pus.

Two years ago I attended during the winter season a young school girl of 17 years of age with frequent severe colds. Fairly large spongy tonsils. Advised removal of tonsils, when she returned home, which was thoroughly done. This past winter I have seen her much more frequently than the previous one on account of almost continuous cold catching.

It is hardly necessary to state that the operation for the enucleation of the tonsils is a major operation of some gravity, having immediate and remote possibilities of danger to the welfare and

life of the patient and therefore should not be entered into without well defined and justifiable cause for their removal.

I cannot but contemplate the removal of the tonsils, which are apparently healthy for the reason that they may prevent systemic infection, or because they may be the probable source of general infection, without a certain amount of misgiving. It seems to me, therefore, that one should most conscientiously consider every case wherein enucleation is suggested for chronic systemic infection, if the tonsils are not enlarged or show evidence of local pathological changes, and weigh carefully the clinical evidences, the possible existence of other infective foci, and the experiences of the operator in previous cases of a similar character as to the results obtained, before committing oneself to the suggestion of operative intervention.

Discussion.

Dr. Henry L. Swain, New Haven, Conn.: The ideal way is for the general practitioner to send patients to us to ask if the tonsil should be removed, but most of us are confronted with the exactly opposite condition. The nurse, the relatives, or others will send a patient to the hospital "to have the tonsils removed." Some tonsils certainly do not need to be removed. Tonsillectomy is undoubtedly performed in many cases in which it is not needed; that is wrong. Any method which will lead to some way of estimating quickly and accurately as to whether a tonsil should or should not come out would be of tremendous advantage. One of the Fellows of this Association, Dr. French, is laboring to that end. He has spent a vast amount of time and labor, using his wonderful inventive ingenuity to this end. At first those of you who read his first paper or have had the good fortune to see him at work, will remember he took a portion of a doubtful tonsil out and right then and there while the patient was still under anæsthetic, in a moment as in the twinkling of an eye he could say whether the tonsil was diseased or not. If diseased, tonsillectomy; if not diseased, thorough tonsillotomy. Now he tells me he has sufficiently improved the method so that with the aid of a new instrument he can tell before the tonsil is touched how diseased it is and can thus act advisedly in operating. When it is further perfected I expect we shall all have no excuse to offer when asked if we can say definitely whether a given tonsil needs to be removed or not.

Dr. G. Hudson Makuen, Philadelphia: I have had several let-

ters from Dr. French concerning his work, and he promises to bring this subject before us at our next meeting in Washington. He is now able to tell whether or not a tonsil is diseased. He thinks he will be able by merely looking in the mouth to tell whether or not pus or detritus of any sort is in the tonsil, and whether or not the gland should be removed. But it is not altogether a question as to the removal of the tonsil; it is a question as to what should be done for the relief of the patient. It is a question of the prevention of the trouble, just as the prevention of sinuitis is advocated. The cases in which I have had the most satisfactory results are those in which I have done the least operation. When pus is found in a single crypt it is sometimes possible to drain it by the use of the cautery knife and thus avoid a tonsillectomy. Some of these cases are inoperable, and it is quite enough to merely drain the parts and thus remove the foci of infection. I think that this can be done in a great many cases, and radical surgery thus be avoided.

Dr. William E. Casselberry, Chicago: I cannot say that I feel thoroughly in sympathy with the point of view presented. It goes without saying that we should not remove tonsils which we are sure are healthy and which will not give rise to systemic infection. It goes equally without saying that we should remove those which are harmful. But the trouble is that one cannot always tell whether the tonsils are or are not the site of focal infection. For the tonsil is like a sponge and despite a thorough search by probing and rinsing of the follicles promoted by eversion of the tonsil with the pillar-hook, one may be unable to assure the internist that it is not harboring in its deepest recesses the focal source of the systemic infection which he is anxious to eradicate. So, when the latter is of serious moment, and no other source discoverable, such is the evil reputation of the tonsils in this respect, that one can scarcely deny justification for their skilful removal merely on the chance of benefit or at least of their exclusion as a possible cause. Surely, however, when the internist send to a laryngologist a patient for examination of the tonsils, and especially if finding no infection there, or if he does find it, he should not fail to look elsewhere in his field for other foci as infection, even descending to the teeth: but particularly should he search "higher up," inasmuch as, nasal accessory sinus suppuration is exceedingly common, and, I believe, is not infrequently the primary source of systemic infection both directly and indirectly via the tonsil itself.

Dr. Hanau W. Loeb, St. Louis: It is easy enough to exclude the teeth, or pyorrhea, or a small abscess at the roots; but it is not easy to tell when the tonsil is at fault. In a case of rheuma-

toid arthritis, getting worse for one, two, or three years, in which repeated examination revealed nothing, and in which the tonsils are not specially large; would you leave those tonsils? I have recently had such a case of rheumatiod arthritis, treated by various internists without result. I removed the tonsils, made a vaccine after the method of Rosenow, used it, and the patient got immediately better. Because the danger of increasing the pathologic process by a single attack of mild tonsillitis is so great, I think we are justified in removing the tonsils, providing, of course, the age, and the general condition of the patient permit. While we should not remove tonsils indiscriminately, in the presence of disease which cannot be otherwise located we are justified in removing them.

The appendix and the tonsil are very closely related as to structure. The fact that removal of the appendix was followed by cure of the rheumatoid arthritis does not necessarily mean that the tonsils should not be removed.

Dr. James E. Logan, Kansas City: Nothing has been said of one source of infection which to my mind is very important, viz: the vault of the pharynx. I think many infections come from failure to appreciate a condition in the vault of the pharynx which is there by reason of neglect of inflamed or degenerated adenomatous tissue, there, perhaps, for years, a constant source of inflammation. If we will clear out these vaults, clean out this adenomatous, fibroid or lymphoid tissue, we will get rid of many cases of systemic infection. This applies so thoroughly to diseases of the ear, to cases of progressive deafness, to persistent, progressive otitis media, that it is my custom in all such cases to remove what is in the vault of the pharynx. I have repeatedly called attention to this, but few others have seldom seemed to attach any importance to it.

Dr. Geo. E. Shambaugh, Chicago: The use of the word "indiscrimate" in the title of Dr. Richardson's paper really excludes all discussion, as no one, I take it, believes in removing tonsils indiscriminately. The question of the removal of the faucial tonsils for the relief of systemic infection is a very important question and one which we should look into carefully.

One of the most important chapters in modern medicine is the relation between focal infection and systemic disease. The importance of this subject has been more generally appreciated by our leading internists than by the specialists. It is not alone the rheumatic conditions that owe their origin to foci of infection but Bright's disease, neuritis, enlargement of the thyroid, and appendicitis, as well as gastric and duodenal ulcers, all apparently bear a close relation to foci of infection. Indeed, it is probable

that we may be as yet only on the threshold of this important subject. The faucial tonsils are but one of the possible foci, albeit the most frequent, for systemic infection. The teeth are another frequent focus. The best way to study these cases is in association with the internist.

The important question for us is to determine when the tonsils are the probable focus of the systemic trouble. If the patient has developed rheumatism shortly after an attack of acute tonsillitis the tonsils should, of course, be suspected as the source of the trouble. If a patient develops an endocarditis during an attack of tonsillitis the tonsils should be removed to prevent another attack. There are many cases of systemic infection of tonsillar origin where the patient gives no history of attacks of acute tonsillitis. In some of these cases it is not difficult to discover positive evidence of infection by examining the tonsils; not infrequently pus can be expressed from the tonsils. In cases where there is no history of acute tonsillitis and where an examination of the tonsils fails to discover any positive evidence of infection, it is still not possible to exclude the tonsils as a possible focus for a systemic infection. It is in just these cases where our work should be done in association with a capable internist. When the internist is unable to discover any other probable focus the tonsils are naturally under suspicion as the most frequent focus for the systemic infection, and when the trouble is serious enough, one is justified in advising the removal of the tonsils. I could relate a number of cases where, under just these conditions, the tonsils were removed, and where deep-seated abscesses in the tonsils were uncovered, and where the patient made a complete recovery from a systemic infection of years duration.

Of course it is reasonable to expect that tonsils under suspicion will occasionally be removed where they are not the source of the systemic infection. I could relate a number of such cases. One such case that comes to my mind at this moment is that of a physician over 70 years old, who for many years had been a sufferer from acute attacks of rheumatism. He had been subjected also, for many years, to recurring attacks of acute tonsillitis. The internist in charge of his case advised the removal of the tonsils which I did for him, but with no improvement in his rheumatism. Later a large prostatic abscess was evacuated, with a great improvement in his systemic trouble. Another case is that of a man of 40 years, with rheumatic trouble developing after an attack of acute tonsillitis and where, six months after the attack, pus containing the streptococci viridens could still be expressed from the tonsil. After the tonsils were removed the rheumatism continued until an abscess under a tooth was dis-

covered and relieved. The streptococci viridens in pure culture was found in this abscess.

Dr. Otto T. Freer, Chicago: It is surprising that Dr. Shambaugh should mention the internist as the one to whom patients should be sent for a tonsillar examination, such an examination belongs naturally to the laryngologist because of his familiarity with the anatomy and pathology of the tonsils.

A doctrine has of late years been ardently advocated by a group of Chicago men who may be called the focal infectionists, this doctrine attributing many chronic diseases, especially chronic arthritis, to chronic systemic infection originating in some latent or inconspicuous septic focus somewhere in the body, but nearly always in the tonsils. The doctrine has failed to convince the experienced because of the exaggerated claims made for it, which are contradicted by common experience. The majority, however which unquestioningly follows authority, has been misled by this teaching into the indiscriminate removal of harmless tonsils because the statements of the focal infectionists make any tonsil, no matter how normal in appearance or devoid of local symptoms of disease, a probable source of one of the multitude of diverse chronic ailments classified by them. That is, such an ailment is taken as unquestionable proof of causal tonsillar disease, whether such disease be locally evident or not, a dictum which is not supported by proof except of the questionable post hoc ergo propter hoc kind taken from case records, helped out by bacteriologic experiments, the more important gross and cellular pathology of the subject being ignored.

The many tonsillectomies into which the medical public has thus been led have often been badly done by inexperienced operators, objectionable mutilations of the palate, septic conditions causing grave complications and even death often resulting. In addition, the numerous failures to remove by tonsillectomy the chronic ailment aimed at are subjecting the profession to the criticism of groping and experimental therapy.

That general infections, notably acute articular rheumatism, many originate from infected tonsils is old and undisputed knowledge. This old knowledge, based on fact and long experience, has, by exaggerating enthusiasm, been expanded into a theory of the most elastic kind, which claims to cure by tonsillectomy chronic arthritis, chronic nephritis, goiter and many other things which the assurance of a patent medicine advertisement.

In contrast to the presumptive tonsillar focus of infection whose existence is supposed to be disclosed by a pain in the back or a stiff neck, how does a real focus of infection as known

to common surgical experience show itself? Most plainly, in addition to evident local inflammatory symptoms by the infection of the nearest lymphatic glands. Thus a chronic root abscess will lead to tenderness of lymphatic glands underneath the lower jaw, an abscess, ulcer or bone disease of the lower extremity to swelling of the glands in the groin, a chronically inflamed tonsil with septic pockets similarly will lead to the well known enlargement of the cervical lymphatic glands. The road travelled by such infections from the tonsils is especially often seen in childhood where greatly enlarged and even suppurating glands in the neck accompany tonsillar disease, but in children, in whom because of the great prevalence of septic conditions in the tonsils the chronic disease of the focalists should be especially prevalent, they are exceedingly rare. They are also rare in connection with the many chronically inflamed and infected tonsils removed because of local tonsillar symptoms by nose and throat surgeons, although, if the focalists theory be true, such tonsils should be the very ones most often complicated by the systemic chronic diseases supposed to be of tonsillar origin, for, if the latent tonsillar focus of the focalist can cause them, although too insignificant to affect even the nearest lymphatic glands, tonsils containing foci formidable enough to enlarge these glands and demand tonsillectomy because of the throat distress they occasion should not only lead to these chronic affections invariably but also in a far more marked degree than the hypothetical little focus of the focalist.

In respect to remains of the pharyngeal tonsil, my observation agrees with Dr. Logan's that a large number of cases of acute and chronic tonsillar infection are merely secondary to diseased states of the pharyngeal tonsil or its remains and I think that the faucial tonsils have received the undue attention accorded to them chiefly because they are so accessible and visible and that the pharyngeal tonsil though even more liable to acute and chronic infection, escapes notice because of its hidden seat.

Dr. Richardson has done conservative rational tonsil surgery a great service in presenting his admirable article.

Dr. Shambaugh, continuing the discussion: The laryngologist should not take the entire responsibility for these cases but should work with the internist in the effort to discover the probable focus for the trouble. Even then there will be cases where it is decided to remove the tonsils, where the systemic infection has an entirely different origin. The absence of infection in the lymphatics of the neck has been referred to as proof that the tonsils are not the seat of infection. In our experience the in-

volvement of lymphatics of the neck bears no relation to systemic infection of tonsillar origin.

Dr. Greenfield Sluder, St. Louis: It seems to me that there are two problems the solution of which will eventually clear up these questions: first, the physiology of the tonsil; second, the perfecting of Dr. French's work, which may be found in the N. Y. Med. Jour., Vol. C, No. 23, 1914, p. 1097, Archiv. f. Laryng, B. 28, 1914. The tonsil takes up what is put upon its surface very readily, this is very quickly absorbed, and is thrown into the system beyond the tonsil (Drs. Wright and Wood, Trans. Amer. Laryng. Assn.) Experiments have been performed by Henke which show that India ink injected into the anterior nares or gums is thrown out by the tonsil. It therefore seems to have a double current function, i. e., one passing into body and one passing out of the body.

I have personally had the clinical experience cited by each of the speakers in this discussion.

Dr. Richardson, closing the discussion: After giving the title of this paper to the Secretary last winter I was sorry several times that I had done so, because the more I thought of it the more I realized how difficult it would be to discuss the subject without incurring the ill will of one faction or another.

Dr. Casselberry agreed with me most thoroughly, without intending to do so. I am glad that Dr. French's work bids fair to solve the problem. Dr. Shambaugh has emphasized one point that I tried to bring out,—that there are other points of focal infection besides the tonsil. It is our duty to be able to elicit these for the internist. Dr. Logan has called attention to the fact that there may be crypts in the pharyngeal tonsil which are as much diseased as the crypts in the faucial tonsil, and which are as apt to cause systemic infection. I recall a case, sent me by an internist, in which the patient asked me to look in her right ear. I did so, and found a chronic suppuration, which she said began when she was fourteen years old, following scarlet fever. She was then twenty-six. She had beginning rheumatoid athritis. I did a radical operation on the ear, but did not touch the tonsils. She is well and working.

We must conscientiously go into these cases, examine the ears, the sinuses, the vault of the pharynx, the teeth, and note whether these will help us in the study. It is not only rheumatoid arthritis, but all the other forms of infection, that may be due to these focal lesions. In cases which cannot be made out thoroughly, even if the tonsils do seem to be infected, one must be on the lookout for syphilis and latent tuberculosis.

THE SURGICAL ANATOMY OF THE SO-CALLED CAPSULE OF THE FAUCIAL TONSIL.

BY G. HUDSON MAKUEN, M.D.

We hear much nowadays about the capsule of the faucial tonsil, and yet I am convinced that few, if any, of us know exactly what the capsule is, how and where it originates, and what is its function. In fact, some of us go so far as to question its very exitsence. Dr. D. R. Patterson, special throat surgeon to the King Edward VII Hospital, Cardiff, and one who has made a very careful study of the anatomy of the faucial region not only in man but also in the lower animals, says that the so-called capsule of the tonsil is merely a portion of the intrapharyngeal fascia or aponeurosis having its upper attachment at the base of the skull and extending down into the region of the esophagus, and in confirmation of this belief he quotes freely from the English and French schools of anatomy.

I have been greatly interested in this discussion, because of the importance which the so-called capsule assumes in relation to tonsil operations, and I am strongly inclined to agree with Dr. Patterson in his conclusions.

"Extracapsullar tonsillectomy" is now a common expression, and I myself so far as I know was the first to use the term "intracapsullar tonsillectomy," and to suggest the possibility of the operation and even its practicability.

An intracapsullar tonsillectomy as I have used the expression means a tonsillectomy in which the tonsil is entirely removed, while the major portion of the capsule is left in the fauces where it naturally belongs and where it completely lines the tonsillar fossa. On the other hand, an extracapsullar tonsillectomy is one in which the entire capsule is removed, leaving an opening through the intrapharyngeal aponeurosis into the deeper regions of the neck and exposing the superior constrictor, the palatoglossus and palatopharyngeus muscles.

If extra and intracapsullar tonsillectomies may be performed,

then it follows that the tonsil must have a capsule or something that passes for one, and the question arises what is this so-called capsule of the tonsil?

As I have already intimated, my conclusions are the results not of the careful embriological and histological studies that the subject requires and of which it is worthy, but only of careful clinical investigations. I am convinced, however, that the capsule does not exist as a distinct entity, like the capsule of the kidney, for example, but as Dr. Patterson says it is made up largely of that portion of the intrapharyngeal aponeurosis or pharyngobasilar membrane into a recess of which the tonsil develops and to the adjacent portion of which it attaches itself with increasing firmness during its development.

It is well-known that the so-called capsule does not surround or completely envelope the tonsil, but it only embraces a portion of its outer surface, sometimes more and sometimes less, depending upon whether or not the gland is submerged or imbedded. A tonsil is said to be submerged when a fold of the intrapharyngeal aponeurosis surrounds it to a greater extent than is usual, separating it from the palato-pharyngeus muscle posteriorly and the palatoglossus muscle anteriorly, and the unattached antero inferior portion of this fold is what is known as the plica triangularis or plica tonsillaris.

When we come to make a careful study of the intrapharyngeal aponeurosis or membrane separating the faucial tonsil from the deeper regions of the neck, we find that it consists not of a single but of multiple or at least several layers of fibrous tissue which may be easily separated the one from the other in somewhat the same way that the layers of an onion are pealed off or separated. The thin inner layer, however, has become so much a part of the tonsil that it is quite impossible to separate the two, but when the separation between this thin inner layer and the deeper layer is begun at any point in the edge of the attachment between the tonsil and the capsule its entire separation is an easy matter, as those of us know who have done the so-called finger enucleation.

An intracapsullar tonsillectomy, therefore, is one in which

only a thin layer of the intrapharyngeal aponeurosis or capsule is found adherent to the tonsil after the operation; whereas, an extracapsullar tonsillectomy is one in which all the layers having been torn or dissected out en masse are adherent to the tonsil leaving the window resection of the pharyngobasilar membrane which I have described.

I have been trying for a long time to determine just why in one tonsillectomy we should have so much cicatricial contraction with pharyngeal and palatal deformities, while in another the results are in all these respects comparatively satisfactory, and I think I may have found the solution to the problem. If we would avoid cicatricial contractions and palatal deformities, we must enucleate the tonsil not only with the least possible traumatism but with the least possible capsule, and I think I have discovered that an intracapsullar tonsillectomy, or a tonsillectomy in which the major portion, at least, of the so-called capsule may be left in the tonsillar fossa, is altogether within the realm of possibility.

While making a careful inspection of a series of recently enucleated tonsils, I found that their capsules varied very much especially in respect to their thickness, and at first I thought this variation was due altogether to the differences in the age of the patients from which the tonsils were taken, the younger ones naturally having tonsils with thinner capsules and the capsules of the tonsils of older patients increasing in thickness with their age, but after making further observations, I found that another factor is operative in determining the character of the capsule and that is the technic of the enucleation. It is a fact, however, as Dr. Patterson has pointed out that the capsule of the tonsil varies with the age of the tonsil and that it increases in thickness with the increase in the age of the patient. As he very aptly expresses it, "like the larva which spins its own cocoon the tonsil may be said to weave or at least add to its own capsule."

So easily is the tonsil at times pealed out of its bed or pocket in the pharyngobasilar membrane of very young children, and so thin is its partially enveloping sheath that I have come to regard this sheath or capsule as merely a compressed portion of

the subareolar connective tissue in which the tonsil happens to be imbedded and which has not yet attached itself even to the most superficial layer of the pharyngobasilar membrane. When this kind of enucleation is performed, we have a veritable intracapsullar tonsillectomy, provided, of course, we regard the capsule of the tonsil as being a portion of the pharyngobasilar membrane to which the tonsil attaches itself.

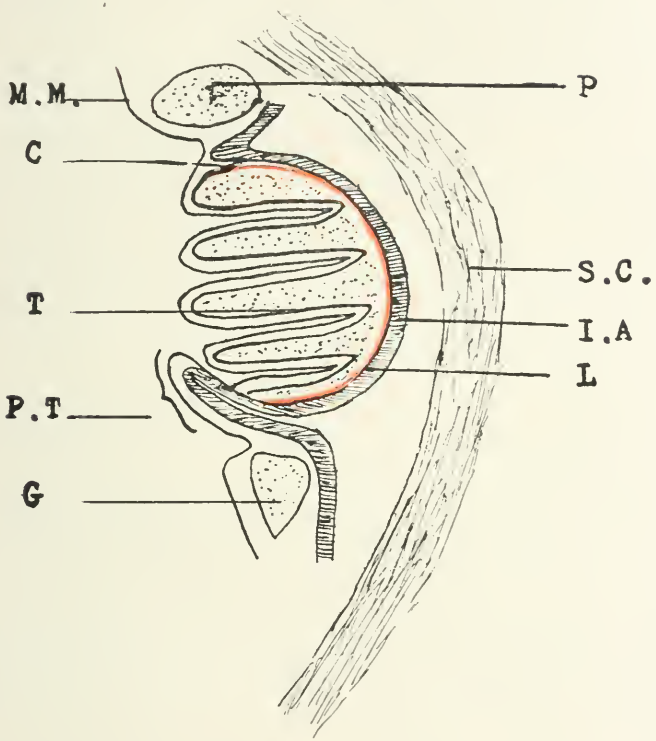
This particular operation, however, is much more easily performed in young children and before the tonsil begins to appropriate the various layers of the fibrous membrane with which it is in juxtaposition. In the course of the development of the tonsil and of the individual in whose possession the tonsil is, a closer and closer union takes place between the tonsil and its adjacent membrane, and this closer union is the result of physiological as well as pathological processes. The tonsil actually seems to grow fast to the membrane, each apparently giving to the other something of its own particular substance, and this process is naturally favored by the pathological inflammatory conditions to which this region is subject.

Even muscular fibers are found binding the so-called capsule to the substance of the tonsil, and these fibers appear to come not from the surrounding muscles of the fauces but rather from the aponeurosis itself, giving to it the character of a musculofibrous sheath rather than a purely fibrous one.

The blood supply of the tonsil passing through the intrapharyngeal aponeurosis also tends to bring about a still firmer union between the tonsil and its capsule, and in the course of the so-called atrophy of the tonsil which only reaches its fullest development in somewhat advancing years, the remnant of the tonsil and the adjacent fibrous layers of the pharyngobasilar membrane become firmly agglutinated, making of them as someone has suggested a strong wall of defense for this region of the pharynx.

If the theory herein advanced relative to the capsule of the tonsil is the correct one, it would seem to have a very important bearing upon the surgery of this region. There is probably no other operative field in which so many different kinds of surgery

have been suggested and tried. In fact, nearly every operator has his own particular technic, and to him at least no other technic appears to be quite satisfactory.



Schematic drawing of a horizontal section of the left tonsilar region viewed from above, showing attachment of the tonsil to the intrapharyngeal aponeurosis. P, palatopharyngeus muscle; S C, superior constrictor muscle; I A, intrapharyngeal aponeurosis; L, inner layer of intrapharyngeal openurosis firmly adherent to the tonsil; G, palatoglossus muscle; P T, plica triangularis, or fold of the intrapharyngeal aponeurosis; T, tonsil; C, point of cleavage in an intra- or intercapsular tonsillectomy; M M, mucous membrane.

There are good surgeons who still adhere to the sharp dissection method of removing tonsils, but if the tonsil's setting in the pharynx is what I have described it to be and what I believe it to be, there is absolutely no necessity for the use of a sharp instrument in the performance of this operation except in those

extremely rare instances in which there are pathological adhesions between the tonsil and the free borders of the adjacent pillars, because in uncomplicated cases there is nothing to cut except only the thin mucous membrane that is reflected from the pharyngeal wall over the inner surface of the tonsil, and this can be separated from the tonsil more readily and more accurately by some form of snare, the wire of which being made to adhere closely to the surface of the tonsil during the enucleation.

Notwithstanding the many tonsil operations which have been recommended, I am venturing to suggest another one or at least a modification of one, which seems to me to enucleate the tonsil more easily, with less damage to the surrounding parts, and what is of greatest importance with less of the so-called capsule of the tonsil than most other operations which have been suggested, and I think I have tried them all.

In the first place, let me say that one of our own fellows, Dr. Grenfield Sluder, in his modification of the old Physick tonsillotome has given to us an instrument that is more generally useful and practical in tonsil enucleations than any other of which I have any knowledge, and in the hands of one who knows how to use it, I can see no possible objection to it. The original Sluder instrument, made in its lightest form, is the one which I use for picking the tonsil out of its bed in a recess of the intrapharyngeal aponeurosis, and once having the tonsil grasped within the fenestra of the instrument the blade being exceedingly dull, I slip a snare over the tonsil on the inside between the tonsil and the instrument and slowly squeeze the tonsil out of its bed, leaving all the so-called capsule except the thin innermost layer which is inseparably adherent to the tonsil and all the mucous membrane except that which covers the inner surface of the gland itself.

This operation is usually done in about eight minutes, two of which are used in picking the tonsils up out of their beds and engaging them within the fenestra of the Sluder tonsillotome, and the other six in slowly drawing the wire through the so-called stumps of the tonsils. The operation requires three instruments, a medium sized Sluder tonsillotome with dull blade, a

snare, and a light forcep for grasping the tonsil before it is entirely enucleated.

The advantages of this technic may be summed up as follows: The operation is very quickly performed, all the instruments are simple, easily manipulated, and easily cleansed, and if a sufficient time is taken for drawing the wire through practically no bleeding follows the operation. Another great advantage is one which I have already suggested, namely, that the wire is in such close approximation to the tonsil that when the operation is finished the major portion of the capsule remains as a lining for the tonsillar fossa, protecting the surrounding muscles and serving as a strong wall of defense against cervical and even general infection.

It is not claimed that equally good tonsil operations may not be done by other forms of instrumentation, but this method in my own hands has not only been more satisfactory but it has given far better results.

The same operation may be done with the Beck modification of the Sluder instrument, in which a wire is concealed within the rim of the fenestra, but I have given that method up because of the trouble in getting and keeping the wire within its groove, and furthermore the wire, being a little more distant from the tonsil does not hug it so closely, and therefore it may in some instances remove more than the single layer of the capsule. The advantage of the snare over the blade of the instrument itself as a means of finally separating the tonsil is that the use of the snare reduces the final area of the separation to a mere point, whereas this area when separated by the blade of the instrument is a slightly curved line; and another very practical advantage is that by the use of the snare there is scarcely any bleeding at all, whereas the bleeding by the use of the Sluder instrument alone is often very profuse.

It is not the operative technic, however, that I desire especially to emphasize in this communication but rather the anatomical conditions which seem to make careful and precise surgery of the faucial tonsil an absolute necessity.

I may say also that the anatomy of the capsule of the tonsil and the so-called plica triangularis which I have described differs

not from that described in 1912 by our colleague and fellow, Dr. Fetterolf, except that he seems to regard the capsule as a distinct entity rather than as being only incidentally a portion of the tonsil, and as a result of this misconception, as it seems to me, he advises beginning the incision or separation for the enucleation of the tonsil anterior to the plica triangularis or at a point between it and the anterior pillar. Such an enucleation, of course, according to the views which I have expressed with reference to the anatomy of the capsule would almost of necessity result in a window resection of the intrapharyngeal aponeurosis, the opening up of the cervical region to infection, and the postoperative contractions and adhesions which we all deplore and try to avoid.

Whatever may be the technic of the operation, the incision or separation should begin behind the plica triangularis and all except perhaps a portion of a very large plica should remain in the fossa where it serves to some extent at least as a mechanical substitute for the tonsil itself.

Summary and Conclusions.

The so-called capsule of the faucial tonsil is not a capsule at all in a strict sense of the term, but only that portion of the intrapharyngeal aponeurosis in a recess of which the tonsil attaches itself in the course of its development.

The intrapharyngeal aponeurosis is a broad membrane having its attachment above to the base of the skull, and extending downward it not only separates the tonsil and the palatal pillars from the superior constrictor muscle and other important tissues in the cervical region, but folds of this membrane protrude themselves between the tonsil and the pillars of the palate, and the anterior fold when it protrudes itself well in front of and below the tonsil constitutes what is known as the plica triangularis or plica tonsillaris.

In the course of its development in embryo and during infancy, the tonsil appears to appropriate a portion of the connective and musculofibrous tissue with which it is in juxtaposition and finally in adult life it becomes firmly attached to this membrane

to which has been given the name intrapharyngeal aponeurosis, and a section of which seems to constitute the so-called capsule of the tonsil.

A complete extracapsullar tonsillectomy, therefore, must leave a window resection of the intrapharyngeal aponeurosis, not only exposing the palatal pillars and the superior constrictor muscle but opening up avenues of infection in the deeper regions of the neck.

A more desirable operation which may be called an intracapsullar tonsillectomy, or better still an *inter*capsullar tonsillectomy, is one in which the tonsil is removed with only the thin innermost layer of the capsule, the major portion of it being left in the pharynx as a complete lining for the fossa where it serves as a strong wall of defense against infection in this region. This intra- or *inter*capsullar tonsillectomy may be done easily and accurately with an ordinary snare in connection with the original Sluder instrument.

Discussion.

Dr. William E. Casselberry, Chicago: I am glad to have heard this definition of terms. I have been performing the same operation as Dr. Makuen, but whereas he called it the intra-capsular method, I, in common with most other operators, have considered it extra-capsular. Inter-capsular would be a better term than intra-capsular, which is positively misleading, for whether that "capsule," which we now remove together with the tonsil, develops from the aponeurosis or from the tonsil, surely, as we see it, it constitutes a capsule of the tonsil, being a smooth, thin fibrous membrance which evelops and delimits the lymphoid structure and which is detachable by cleavage from the major portion of the aponeurosis. The smooth dissection of this thin fibrous capsule from the major portion of the aponeurosis is, I believe, the best operation. Thus confined, it results in no distortion of the pharynx. In the majority of instances it is unnecessary to embrace much of the plica or more than the merest strip immediately adjoining the tonsil of the mucous covering of the pillars and none of their muscular structure.

Dr. J. Gordon Wilson, Chicago: If I understand Dr. Makuen correctly he claims that a part of the lateral aponeurosis of the pharynx forms part of the capsule of the tonsil. This aponeurosis is the name given to the strong connective tissue septum,

especially thick in the naso-pharynx, which extends from the base of the cranium to the oesophageal aponeurosis below. I find it hard to believe that this structure enters into the capsule. Such appears to me to be contrary to our anatomical teaching; nor can I conceive how this fibrous septum can get to the pharyngeal side of the constrictor and pharyngeal muscles.

Dr. George E. Shambaugh, Chicago: I cannot follow Dr. Makuen in tracing the thickness of the capsule of the tonsil to increasing age and in his view that the tonsil becomes more and more adherent with age. In my experience this is not the case. I have taken out the tonsils in people of seventy, in whom they were as loosely adherent as in infancy. If they are firmly adherent it is because there has been a great deal of inflammation, and not because of any physiological change in the tissue.

Dr. Henry L. Swain, New Haven, Conn.: I have obtained a good deal better idea of what the capsule of the tonsil really means by studying the growth and development of the lingual tonsil. Much can also be learned by the microscope in connection with the behavior of the lymphoid tissue of the posterior pharyngeal wall when it heaps itself around the outlet of the mucous glands into the so-called follicles of the pharynx. The larger they grow the more they push the connective tissue elements together until there appears in the lingual tonsil a complete limiting membrane. In a certain sense the above is true of the faucial tonsils and the connective tissue layers forms as an impression or mould in which the tonsil lies. The larger the tonsil the thicker the capsule, and the smaller the tonsil the thinner and less defined the capsule. If the faucial tonsil is dissected out in the cadaver, it is found that there is, in the child, a very slight line of demarcation where the covering membrane of the tonsil ends and the pharyngeal aponeurosis begins. In very young children there is practically no microscopic distinction between the connective tissue on which the tonsil rests and the adjacent layer of the aponeurosis. In operating in such very young patients we sometimes get portions of tissue which we do not want, and that is why we get contractions and adhesions. Sometimes we can do as Dr. Makuen thinks he does every time, get between the layers of the so-called capsule of the tonsil. I have seen him operate, and he does seem to prove his proposition. But to all intents and purposes his results do not greatly differ from ours who do other operations. With the Sluder-Beck instrument we absolutely get out the capsule of the tonsil as clearly as in any dissecting operation. I think Dr. Makuen and the rest of us have been doing exactly the same operation, in that we do remove

the tonsil with a definite layer of capsule upon it and yet have the tonsillar fossa also lined by a smooth well-defined limiting membrane. That is the ideal toward which we all strive even if we do not attain it every time.

Dr. John F. Barnhill, Indianapolis: If I understand correctly, Dr. Makuen holds that the capsule is not continuous around the tonsil, but is part of the deep fascia in the neck. After hearing him read this paper in Cincinnati, I was curious enough, when I returned home, to save a large number of tonsils removed by the Sluder method. I have recenly gone over these tonsils. It is not difficult to demonstrate that there is a limiting membrane having nothing to do with the deep fascia of the neck. Dr. Makuen spoke of splitting the capsule. I could not understand that at the time, but having studied these tonsils which I saved I can now see how one might speak of splitting the capsule, or rather, the tissues around it which are removed with the tonsil. I have brought along a large number of these tonsils, which demonstrate, I think, that there is an external capsule which is possibly connected with the deep fascia of the neck, and another which has nothing at all to do with this.

One of the tonsils in this collection, by the way, shows a portion of the styloid process.

Dr. Lewis A. Coffin, New York City: My conception of the tonsil with its capsule is about that of a tangerine orange inside its peel. The outside skin or peel of the tangerine is comparable to the tissues external to the capsule of the tonsil, without the fibrous covering just over the pulpy part of the tangerine, which is connected with the interfibrillar tissue of the fruit. The fibrous covering corresponds to the capsule of the tonsil.

Now one can easily remove the pulpy cellular portion of this fruit inclosed in its delicate web-like capsule without in the least injuring either the pulpy portion of the fruit or its peel, but should one undertake to separate this delicate web-like retaining structure into layers, or, in other words, to split it, he is liable to get mussy and soil his hands. If, however, he will leave the fruit alone for a time the fibrous capsule between the lucious pulp of the fruit and the peel seems to thicken and the fibrous envelope can be separated into layers. The normal tonsil is like the fresh fruit, whereas the tonsil which has been the seat of repeated inflammatory attacks takes on physical characteristics comparable to the older or dried out fruit.

Dr. Greenfield Sluder, St. Louis: I have listened especially for one point which has not been cleared up in the discussion. I have been very much interested in this subject for several years, and feel very much gratified that Dr. Makuen should

have used the *principle* of picking up the tonsil, to which I called attention before the laryngological section of the American Medical Association in 1910. The instrument was not original with me; it is the guillotine of Physick, 1827. It has been strengthened, but not changed. The point to which I referred, which has not been made clear, is the capsule-splitting process. Is there a delimiting tonsil membrane which closes the crypts in their depth and is there another fibrous de-limiting membrane which covers the constrictor and pillars, are the crypts closed by the envelope? (Dr. Makuen answered that it is closed, by a very thin membrane.) If that be uniformly the case, this technic is the ideal method of tonsillectomy. If, however, it does not remove the last cell of lymphoid tissue it is not a success, because the activity of this lymphoid tissue remaining will bring about a recurrence of the condition for which the operation was performed. The lymphoid tissue in the throat is often very active—perniciously active. I have seen it grow up into the wound, sometimes, from the lingual tonsil, developing all the clinical symptoms which the case presented originally.

Dr. Makuen, closing the discussion: Dr. Casselberry has referred to terms and definitions of terms, and I may say that I used the term intra-capsular tonsillectomy chiefly because no distinction has been made between what Dr. Wilson has called the true capsule, namely, the very thin membrane surrounding and enveloping the lymphoid structures of the tonsil, and the intrapharyngeal aponeurosis to which the tonsil with its "true capsule" becomes so closely attached. I have found that frequently after the enucleation of a tonsil with a sharp instrument the adjacent section of the intrapharyngeal aponeurosis to which the tonsil is attached is taken out with it, and the operation has been called extra-capsular tonsillectomy. In the so-called finger enucleation the great difficulty was in keeping inside of the intrapharyngeal aponeurosis, and when this is not done a considerable damage to the surrounding tissue always follows. Someone in New York reports one hundred tonsillectomies performed in that city, eighty of which resulted in deformities of the palate. We do not all do the beautiful operations that we would like to do, and unless we are very careful we are sure to get some unfortunate results.

THE ETIOLOGY OF PANSINUSITIS.

BY J. GORDON WILSON, M.B., C.M.

The thoughts which I venture to present on the Etiology of Pansinusitis are not new but represent my present attitude in regard to this subject. This has been to some extent the result of a series of observations on the effects of toxins in the frontal sinus which I began some years ago and which later have been extended by two of my colleagues in the clinic. We are not prepared at this time to publish our results. The work has proved much more complex than we anticipated and is far from complete. Most of our results have been negative yet some afford a basis for the suggestions I present in this paper.

One object we had in view in the investigation was to ascertain the possibility of local irritants of bacterial origin in one sinus setting up irritation in a neighboring sinus, healthy or aseptically injured either by direct continuity or diffusion of the irritants. We prepared capsules containing virulent micro-organisms which were inserted into the frontal sinuses of dogs. Both frontal sinuses were opened under aseptic conditions; one sinus was used as control and the following substances were placed in the other sinuses: Celloidin capsules containing sterile bouillon, trypan blue, cultures of streptococci, staphylococci, bacillus coli, bacillus ozenae, and an unknown bacillus taken from a nasal discharge of a dog. On one occasion there was introduced a cloth sack containing killed tubercle bacilli; on another 2 cc. of a bouillon culture of a bacillus obtained from the nasal discharge of a dog. In all, care was taken not to injure the ostium and on post mortem the ostium was found patent though at times surrounded by swollen mucous membrane. The dogs were killed at periods of from 48 hours to 5 weeks.

The sinuses containing the capsules all showed marked reactions. They contained fluid of a serous, sero-mucus, or muco-purulent character but small in amount. The bacteriological examination is incomplete; we can only say that smears showed no

organisms. The mucous membrane was thickened and if examined soon after the operation was dark red in color. In those examined after longer periods, the mucous membrane was thickened, but pale and oedematous in appearance. The gelatinous appearance of the mucous membrane was at times very marked, in one case appearing like a polypoid growth. Microscopic examination of the membranes showed numerous round cells, especially plasma cells.

The sinuses in which no capsules were placed, with one exception appeared to be normal after the lapse of a few days required for the traumatic effect to pass. The sinus in which the bouillon culture of the bacillus from a dog's nose had been placed had a normal appearance macroscopically.

It seems that a frontal sinus is able to recover very well after opening, but after the introduction of the capsules and especially when these contained a diffusible irritant there was marked disturbance and permanent injury. While marked hyperaemia was found in the other nasal cavities after the operation in no case was this other than a passing effect. In short no effects traceable to the toxins were ever found in adjoining sinuses.

The Sinuses accessory to the nasal cavity can be anatomically grouped into two divisions:—

(1) An anterior—comprising the frontal, maxillary and anterior ethmoidal, which open into the middle meatus beneath the middle turbinate.

(2) A posterior—comprising the sphenoidal and posterior ethmoidal which open into the superior meatus above the middle turbinate.

A pan-sinusitis may involve either of these groups or both.

In discussing the Etiology of pan-sinusitis it cannot be your wish and it is not my intention to enumerate the diseases in which it has been found to occur nor to tabulate the micro-organisms that may be the apparent aggressors. This has been amply covered by numerous articles and by many text books. It is rather my intention to consider some local anatomical and physiological factors which explains why it does not occur more frequently and which when they are defective or destroyed lead to its occurrence and persistence. I feel that you may justly

blame me for dwelling on many elementary facts. My apology is that elementary facts are the basis of knowledge. I believe that it is good to reconsider from time to time nature's method of preventing disease and of effecting spontaneous cures. Such a reconsideration strengthens our desire to safeguard with all jealousy the barriers that have been erected for man's protection.

There are some elementary facts which afford a basis from which one can start—so well recognized that one need but state them:—

(1) No sinus inflammation can occur unless the physiological activity of the sinus be disturbed or destroyed.

(2) It is not the physical presence of microbes either in the sinus or its vascular system that induce inflammation but the toxins which come from their growth and disintegration. The condition of the tissue on which the bacteria are implanted influence the future course of the disease.

(3) The low grade of inflammation which we associate with ordinary catarrhal colds may have as their primary cause irritants other than those which arise from the local presence of pathogenic organisms. Under this would come climatic disturbances and metabolic disturbances due to disease elsewhere in the organism. By catarrhal inflammation I understand a slight grade of change, affecting mucous membranes, whose dominant feature is irritation rather than necrosis. The irritation is shown by the congestion of the underlying vessels, abundant exudation of serum containing some leukocytes and the casting off of many of the columnar epithelial cells. The excretion of mucus is increased and forms a layer over the inflamed surface. This mucous discharge is, to a considerable extent, protective; not only are bacteria detained in it, but it is claimed to have a certain amount of bacterial activity, and irritants which may appear on the surface during the attack diffuse through it with difficulty.

(4) The lowered resistance which occurs in general metabolic disturbances (e. g., diabetes) may produce more chronic and insidious processes, but the part played by them in disease apart from organisms is not known.

Passing from these generally accepted principles we may now consider some of the anatomical and physiological factors present

in the sinuses whose structure and activities prevent the occurrence of disease. From this point of view I would ask you to consider the ciliated cell and the lymphatic system. I need not remind you that the mucous membrane is lined by ciliated cells, with numerous mucous secreting cells.

In the ciliated cells the cilia which are very fine and relatively short, are extensions of cell protoplasm covered like the cell with a delicate membrane. Their action consists in a simple bending over of all the cilia which crown the cell, followed by their return to the vertical position. Their purpose in the sinuses seems to be to produce a movement of fluid or mucus over the surface which they cover in the direction of the ostia, and working in harmony with the nasal cilia the secreted mucus is moved on towards the anterior nares. The secreted mucus gathers up all extraneous matter which is cast off into the sinus cavity during the life of the cell and any extraneous particles which may have accidentally entered during the diffusion which results from the positive and negative pressures present in the sinuses during respiration.

"During the life of the ciliated cell the cilia are in constant activity; bending over and recovering themselves many times a second. So rapid is the movement that the action of the individual cilia cannot be seen except when it begins to slacken, which may be caused by cooling the preparation or may accompany commencing death of the cells. But the general effect of the whole movement as it has been studied elsewhere has been compared to the rhythmic wave-like motion which is produced by the wind upon a cornfield." (Schäfer in Quain's Anatomy, London, 1912, vol. II, part I, p. 73.) The movement begins at one part of the ciliated surface, and gradually traverses the whole surface in the form of a wave, and this is succeeded by others at regular intervals. The decrease of the ciliary movement is at least partly responsible for the invasion of the sinus by bacteria just before death in some cases and after death in all cases. The normal ciliated mucous membrane is impervious to micro-organisms. If the surface be not too greatly destroyed or denuded during the course of the inflammation or operation the epithelium which grows in from the side as flattened epithelium ultimately

acquires cilia, the amount of regeneration being influenced by the age and condition of the patient.

The arrangement of the lymphatics of the large sinuses has a direct bearing on the liability to infection. The elaborate interlacing vessels in each sinus radiate towards the ostium where they surround its free border. They there communicate with the main channels in the nose where they pass back into the depression between the tube and the inferior turbinate. The direction of the lymph flow in each sinus therefore diminishes the tendency to lymphatic infection.

It will be apparent from this brief sketch that we have in each sinus an anatomical and physiological mechanism of simple type adapted to free these cavities from the accumulation of such local irritants as arise during the normal life of the cells which line it, and an isolated lymph system giving the best possible chance against microbic invasion. With this in mind we may proceed to consider the changes which result in the breaking down of these safeguards.

Thus far we have dwelt on the independence of the sinuses in regard to their lymphatic system and their ciliary mechanism. We now must recall that these cavities are largely supplied by a common artery (the spheno-palatine) and are closely associated with a common vasomotor mechanism at the upper part of the respiratory tract and that the ostia in each division are relatively close to each other. In short, that an irritative lesion of even moderate intensity in or near one cavity must affect the other cavities more or less. This was shown in our observations on aseptic traumatic injury of the frontal sinus in dogs.

From this standpoint it will be well here to consider how that most common vasomotor disturbance arising from a variety of causes and generally termed a rhinitis will affect the sinuses. In ordinary rhinitis we have a local inflammation: associated with it we have a congestion of the whole nasal mucosa and submucosa. This congestion involves more or less all the sinuses and especially those in one group. Into them mucus is discharged but the epithelial structure is still intact, though some shedding of the epithelium comes away with the exudate. The openings though restricted in size from the swelling are not undefended

by the cilia and mucus. On the whole there is little chance of invasion of discharge or of bacteria directly from the nose. As the local inflammation subsides the congestion disappears, the cilia rapidly recover and the exudate which is not absorbed is cast out by the ciliary movements and the sinus recovers. If, however, the inflammation be so acute that the physiological protection and barriers are interfered with or no longer effective the morbid processes are different.

(a) The cilia no longer can remove the effusion which accumulates and this is increased by the action of gravity in such a cavity as the maxillary. This mucus accumulation with its epithelial debris acts as a mechanical irritant to keep up the sinus engorgement. From the formation of some of the cavities it is obvious that this secretion may persist after the rhinitis has disappeared.

(b) The nasal lymphatic engorgement present in all inflammations may be such that the disturbances in lymphatic circulation in the congested sinus produces a lymph stasis and the initial step in a lymphatic infection; or the presence of the accumulated fluid referred to above and the persistent congestion may at a later stage produce the lymph stasis and infection.

(c) Following the lymphatic disturbance comes bacterial invasion either by direct invasion along the lymphatics or by the exudation from the lymphatics becoming infected and the sinusitis follows. Luckily although all the sinuses are involved in the congestion the resulting suppuration in all or even in one is relatively rare.

(d) In some cases it may be that we have a mechanical interference with the cilia by bacteria similar to that found by Mallory in whooping cough. In such there would be the possibility of superficial invasion by micro-organisms.

Chronic pan-sinusitis, the form in which the disease usually comes to our notice, appears to me to follow the same general course, namely, a failure in the cilia to remove effectively the secretion, a chronic turgescence resulting in repeated lymphatic stasis, and finally invasion. In some cases the cause may be a slight chronic rhinitis with mild exacerbations or the involvement of one sinus with recurring subacute attacks of rhinitis

with gradual involvement of the other sinuses. As we shall point out later it is exactly in such cases that micro-organisms abound.

Other factors may be at work, for instance:—

(a) Narrowing or obstruction of the ostia or of the nasal cavity from mechanical causes.

(b) Disease in the adjacent part of the nasal cavity which has resulted in destruction of the cilia.

(c) Scar tissue, tissue devoid of cilia, either from disease or from nasal operation.

The chronic turgescence may be so slight as never to awake suspicion. It may be so slight that it is beyond our diagnostic ken. It may be so slight that bacterial activities and toxin effects are counterbalanced by tissue activities or antibodies within the limits of health. It is in such cases that a slight increase in congestion may be enough to disturb the balance. It is in such cases that debilitating diseases and haematogenous infections may set up a pan-sinusitis.

So far I have said nothing about the particular variety of infection—my idea has been to get at the general principles which underlie all. When we come to consider the bacteria involved we find it satisfactorily established that a variety of micro-organisms may be found in the healthy nasal and postnasal cavities of most individuals. These bacteria are frequently few in numbers, of low vigor, and of little or no virulence. In the sinuses of man the evidence available compels one to accept the view that the normal sinus—certainly the frontal and maxillary—contain no bacteria. On the other hand, in the nasal cavities and probably in the nasal accessory sinuses of many persons who are apparently in the enjoyment of excellent health, but who are at the same time suffering from a chronic catarrhal inflammation of the mucous membrane of their upper respiratory passages, bacteria are present and are more or less virulent. From a variety of causes which diminish the tissue resistance such as debility, chills, traumatism, their virulence is increased. It is in such cases that the introduction of a fresh organism may produce changes which allow bacteria already present but quiescent or avirulent to become virulent and give rise to acute or subacute infections. It is along this line that a gastro-intestinal disturbance produces

such metabolic changes that it may set up a coryza and the treatment call for a recognition of this etiological factor. The chief organisms which are found and which demand our attention are the pyogenic cocci, the pneumococcus, the micrococcus catarrhalis, the influenza bacillus, the meningococcus and the bacillus tuberculosis (Lewis and Turner, Suppuration in Accessory Sinuses of the Nose, Edinburgh Medical Journal, 1905, vol. 18, p. 393.)

It may be argued that I have not considered many etiological factors which influence our treatment. Thus there is the seasonal factor. In winter we have the respiratory attacks predominating, in summer the gastro-intestinal, and in the transitional period the respiratory and gastro-intestinal. We have the former period when colds and coryza predominate, the second period that of diarrhoea and food intoxications, with coryza secondary, and the period when both are equally at work. In our treatment we have to consider these etiological factors, but from the standpoint of this discussion these are secondary to the general principles to which I have referred.

It may be urged that I have paid too little attention to the specific organism. This is true because I believe the organism is most often an invader into an already damaged sinus. And further the same morphological organism can vary so much in its virulence that until we know more about the cause of this variation we are not likely to get far in considering its etiological significance.

An interesting etiological speculation might be the antitryptic property of exudate into the sinus. As you know serum normally is bactericidal. This property it loses on standing or in the presence of leukocytes undergoing decomposition due perhaps to the loss of its antitryptic property. It then becomes tryptic and acts both as an irritant and a fit medium for growth. Whether it has any influence here we do not know. It is at present interesting because of the recent suggestion of Almroth Wright that wounds can be irrigated by antitryptic serum. .

It may be urged that I have neglected to enumerate such obvious etiological factors of pansinusitis as the overflow of secretion from one sinus into the other; as the possibilities of defect in the septal walls tending to its causation and many others. That

is true; I have endeavored to leave alone individual facts and get at general principles.

In conclusion I would express the opinion that a healthy sinus has great protective power against bacterial invasion and great recuperative power after the simple hyperaemias which occur during a rhinitis. I would urge you to consider that it is chiefly in the chronic rhinitis that we have the potentialities of a pansinusitis. That these potentialities are influenced by:

(1) Circulatory disturbances, vascular and lymphatic, accompanying or produced by the rhinitis.

(2) The inability of the sinuses to clear themselves of the excess of exudate, resulting from the inflammatory irritation.

(3) The infection.

The disturbance resulting from the first is such that there follows the failure of the second which inevitably leads to the invasion of bacteria. I agree with Wright and Smith (Wright and Smith, Diseases of Nose and Throat, Philadelphia, 1914, p. 139) that "even in the most virulent cases, with high temperature and the systemic signs of sepsis, there is unquestionably an antecedent change in the mucous membrane and its secretions which have accorded these frequent denizens of healthy noses an opportunity for malefficient activities. A severe coryza terminating in resolution and a restoration of the structure of the intranasal mucosa to a fairly normal condition often takes place when the mucous membrane of the accessory cavities remains charged with the products of inflammation." I ask your special consideration to this last sentence as I believe we do not realize its full significance. Our best internists appear more alive than some rhinologists to the possibilities of the accessory sinuses being charged by the products of a low grade inflammation—producing apparently little or no local observable effects. The time has come when we are being asked if we have not in the sinuses the possibility not of a suppuration cavity but of a cavity where endotoxins are being set free, resulting in an auto-intoxication.

It is our task to diagnose and treat. But the wise treatment will recognize why nature has broken down and aim as far as possible at compensation. It will aim at not leaving any one sinus so impaired that it acts as a source of danger. To replace

epithelium in a dependent cavity by scar tissue is to replace it by tissue with no physiological action. I cannot conceive of a healthy antrum ever existing after extensive curettage. The teaching of nature is obvious. The mucous membrane of the accessory sinus is doing important work. We may aid by reducing chronic vascular and lymphatic engorgement. We may aid by assisting in the removal of excess of secretion. But if we do so at the expense of permanent damage to the ciliated walls we may well go slowly, and ask what compensation we offer for this loss.

Our knowledge of the etiology is unsatisfactory, our knowledge of the cause and effects of low grade inflammations most disappointing. But it is along the lines which I have sketched that some day we hope to know more.

NON-OPERATIVE TREATMENT OF THE ACCESSORY SINUSES.

BY LEWIS A. COFFIN, M.D.

In the light of a fairly long experience, and in the light of the present day laboratory teachings, I have ceased to think of the cure of the disease of the accessory cavities of the nose, by either operative or non-operative procedure. I am satisfied when I have accomplished a result sufficient in any case that I may speak of the disease as arrested.

My experience has been that in many cases in which I have done most thorough and radical operations there have been recurrences of the disease at variable lengths of time. The time has varied from one to five or six years. Another matter of experience is this: a sinus diseased and treated to the point at which the patient is discharged as cured seems more liable to a reinfection than do those sinuses in the same patient to become diseased which have not previously been affected. We have analogies in other sections and organs of the body and in other diseases. One man may have more or less frequent attacks of boils always occurring in the same location on the body, whereas he is apparently well between attacks. I know a man who has periodically a carbuncle always at the same site.

Syphilis and tuberculosis—in their recurrent manifestations—teach the same lesson. Perhaps we may explain the matter in present-day language, thus: if we consider the infecting germ as an invading army, we witness the efforts of the invaded host as those of an army which enters on a defensive warfare. The manifestations of this warfare constitute disease and the result of battle is determined according to the relative strength of the combatants. As physicians we array ourselves on the side of the defense and it seems that we may hope to vanquish the invading army somewhat, according to the method and cunning of his entrenchment. Our efforts are twofold: first, we endeavor to destroy the enemy, and second, we try to so bolster up and

strengthen the invaded body as to enable it not only itself to put up a better fight, but to the end that it may come out of the conflict in better condition than it could otherwise have done.

It would seem that at a certain point when the invading army has been so effectively overpowered that all signs of disturbance cease there may remain many of the invaders, and that through entrenchment on the one hand or effective interment on the other warfare ceases and the body is at peace, until such time as for some reason the balance of power between these invading elements is again in a state of unstable equilibrium and the manifestations of renewed strife appear, or medically a relapse has taken place.

Undoubtedly it is scientifically possible and practically demonstrable that cure does occur, but it is not scientifically nor practically possible to say at the time of the particular patient's discharge from further treatment whether the arrest of the disease is temporary or permanent; but I am wandering afield.

My purpose at this time is to discuss the treatment of sub-acute and chronic empyema of the accessory cavities of the nose along non-operative lines, the treatment of which further than the mere toilet has been essentially surgical.

So well established is the treatment of acute sinusitis that I shall not take the time of this society in discussing it.

Of the non-operative treatment of the more chronic forms of sinusitis however, I have given much thought during the past year and am glad to feel that my efforts have not been without some degree of success. I purpose to outline the development of the method I am now using, describe the apparatus, medicinal agents used and report a few cases.

During the winter of 1913-14 I was treating sub-acute and chronic empyema of the accessory cavities of the nose by the application of negative pressure in conjunction with autogenous vaccination. The negative pressure is obtained in the following manner: into the nostril on the side of the head to be treated is inserted an olive pointed tip connected by rubber tubing with a vacuum bottle and sufficiently large to close the nostril; the ala of the other nostril is pressed against the septum and the patient instructed to say, "ka," "ka," "ka," while the suction is applied. This procedure does not always pull the mucus and pus into the

vacuum bottle, in fact it never pulls all the muco-purulent secretion into the bottle, but this can be accomplished subsequently by means of a canula connected with the suction apparatus; or, after as much muco-purulent material has been drawn into the nose from the accesory cavities as, is possible by the suction, the nose may be cleansed by a nasal douche. But one case of empyema was completely arrested by this method. This was a case in which the disease was confined to those cavities which drain into the superior meatus.

One day during the early part of the winter just past I took to the pathologist of our hospital a culture taken from high up in the middle meatus of the nose of a patient on whom I had just previous to taking the culture made several applications of the negative pressure. The pathologist said he did not think it possible to pick out the pathogenic organism as the plate was so densely covered by air germs. Someone standing by remarked that this was probably on account of the inrush of air following the removal of the nasal tip of the suction apparatus. To myself I thought if this be so, why may we not offer a medicated air to these vacuumized cavities. I immediately constructed an apparatus by means of which I was able to do this.

The air entering the vacuumized nose and cavities under a considerable pressure is medicated by a nebula of oil variously laden with remedial agents. The vacuum bottle and the tube leading from it to the nose are open to the pressure current through the nose when the exhaust pump is shut off from the vacuum bottle. This permits the pressure current to drive the mucus and pus from the nose into the vacuum bottle. The change in the nose from a positive to a negative pressure may be made as often and for as great a length of time as one desires or as the case demands. By means of this procedure one may draw from the accessory cavities much more pus than can be done by suction alone, and to my mind there can be no question but that the medicated air reaches well into these cavities. I have used autogenous vaccines in conjunction with this procedure and have been able in two chronic cases to cause an entire cessation of discharge in which suction alone in conjunction with the vaccines had failed entirely. It sometimes happens that even with the combined use of the nega-

tive and positive pressure a certain amount of secretion can not be drawn or swept into the vacuum bottle, for that reason I have a small silver catheter which attaches to the nose piece of the instrument. With this catheter one can pick up any residue of secretion from any part of the nose. After the nose and air cavities have been as thoroughly cleansed as possible the process of alternate suction and pressure is done from 10 to 20 times in order to carry the modified air well into the cavities. Both the negative and positive pressure are under control and the amount of each is registered by an index.

If the negative pressure be started low, say at 5 units, it may be gradually increased to 15 or 20 units, without discomfort to the patient. The nebula is thrown into the nose under a pressure of from 10 to 15 units. Cases of atrophic rhinitis can stand neither a negative nor positive pressure with comfort beyond about 8 units.

The instrument consists of two (2) bottles mounted on the lower side of a tube one half (½) inch in diameter which I will call the connecting tube. The bottles are mounted close together at one end of the tube the other end of which terminates in an olive pointed tip about three and one-half (3½) inches from the bottle; between the bottles is a switch key by means of which the inside of either bottle may be connected with the lumen of the connecting tube, the inside of the other bottle being at the same time disconnected from the same. Between the bottles also is a small tube extending through the key sleeve for the attachment of rubber tubing which connects the apparatus with an exhaust pump. When the key is so turned as to connect the second bottle with the connecting tube one is able to create a vacuum in this bottle by working the exhaust pump. This bottle is five inches in length and one inch in diameter and is the vacuum bottle of the apparatus. This bottle connects with the nose by means of the olive point and when the naso-pharynx is closed off from the oro-pharynx the nasal chamber and any cavities connecting with it are partially vulcanized when such a condition exists in the bottle. The nasal chamber may be closed either by instructing the patient to say "ka," "ka," "ka," or the ballooning of a small rubber bulb in the choana.

The first bottle is a nebulizing outfit; it is three inches in length and one inch in diameter and may be connected at the proximal end of the connecting tube by means of an ordinary shutoff with a pressure pump or tank. It is the medicine bottle. When the shutoff is open a nebula is formed in the bottle and if the key be so turned as to connect this bottle with the lumen of the connecting tube the nebula is thrown into the nose through a small tube inside the connecting tube. If the key is not so turned the nebula is thrown from a safety vent between the bottles. By working both the suction and pressure currents at the same time one may produce in the nose either a suction or a compression effect at once and may alternate from one to the other immediately.

Remedial agents:

Whereas the apparatus presented may be so constructed as to throw into the vacuumized nose a liquid, spray, nebula or vapor, the one which I have used is so constructed as to throw either nebulae or vapors. I first used oxygen, but subsequently have been using mineral oil variously medicated as a nebula. My first combination was a 5% solution of carbolic acid and Churchill's tincture of iodine. In this preparation the iodine seemed to be thrown out of solution by the action of the nebulizer. I am now using either an oil loaded with Bulgarian bacilli or one of the proprietary preparations of iodine. I have used both liquid iodex and the 5% solution of petrogen iodine.

Mrs. J. W., a lady 77 years of age, consulted me on October 1, 1914, on account of a copious discharge from the left nostril. She came with her own diagnosis of sinus disease, as she said she had been treated all the previous winter for the same trouble, which had originally been diagnosed by her oculist whom she had consulted on account of the pain in and above the eye. At the time she came to my office she told me that at home, on account of the amount of discharge, instead of a handkerchief she was using soft paper and burning it. I treated her daily for two or three months by means of suction and vaccines. She was kept more comfortable during this time, but there was little difference in the daily output of the muco-purulent discharge. The vaccines were stopped—while the other treatment continued. I began the combined use of suction and compression about January 15, 1915, using the iodine and carbolic nebula under considerable pressure. By this method I for a considerable time

obtained a much greater quantity of the muco-purulent secretion. About the last of February she asked if I would not again use the vaccines, as she was sure she felt better while they were being used. The vaccine was accordingly prepared, but about this time, to be exact, on the 2d of March, she stated that she should not return for further treatment. On the 3d of March I received my first consignment of oil loaded with the Bulgarian bacilli. As my patient had based her determination not to return on a financial basis, I felt at liberty to write and ask her to return, and offered to treat her without money consideration. She accepted the proposition, and on March 5th I resumed treatment, using a nebula of oil containing the Bulgarian bacilli, and again began the vaccinations.

Previous to this I had two or three times a week irrigated the antrum always washing out a considerable amount of pus—this process was not repeated after beginning the use of the Bulgarian bacilli.

Improvement was marked, and rapid. No pus was seen in the nose after the 20th of the month, and on the 24th she showed me a perfectly clean handkerchief, which she had carried for two (2) days. I have the handkerchief. I continued the treatment at from intervals of 2 to 4 days for about two weeks, when she was discharged in a condition which she described as "absolutely cured."

An interesting case is that of a young Polish woman, J. A., 20 years of age, who came to the eye clinic of the Manhattan Eye, Ear and Throat Hospital on January 7, 1915.

She gave a history of supra-orbital headache of more than a year's duration.

Diagnosis of episcleritis was first made, later a cyclitis developed. Patient complained of intense pain—the treatment consisted of leeches, atropin, hot fomentations, aspirin and mercurial inunctions—all of no avail. She received one injection of tuberculin for the scleritis, which became worse immediately afterward. I was asked to see her on January 21, 1915. Eye was swollen, partially closed on account of a droop of upper lid. Tissues about eye were almost mahogany colored; nose filled with pus.

She complained of great pain in the eye and at the lower and outer border of orbit, was extremely tender over all palpable sinuses, could speak but few words of English and shrank from all painful procedures.

I advised a radical Killian operation and appointed time for same. At this point her brother made appearance and objected to any operation which might leave a scar if it could possibly be avoided, and asked that Dr. MacKenty be asked to see the case

with me. Dr. MacKenty agreed with me that probably the Killian was the best procedure, especially as, on account of a considerable bowing of the septum to the diseased side good intranasal operation could not be done. The brother consented reluctantly. During the two or three days that elapsed before the operation was to be done I determined to see what I could do intranasally. I removed the anterior end of the middle turbinal, put her on douches and applied suction. She improved as to pain and eye symptoms.

About this time I had my apparatus working and I determined to test it out on this case. When she had been under treatment for two weeks, all pain had ceased; the eye was normal, and she returned to work. We were still getting great amounts of pus from the nose. Vaccination was done while she was still in the hospital, the streptococcus in pure culture was the infecting agent. The secretion of pus began soon to diminish and I have not seen pus in her nose now for a period of about two weeks, nor have I been able to draw it into the vacuum bottle.

Miss S., aged 22, has been catarrhal for several years. Three years ago had a double mastoiditis operation. Referred to me again on January 19, 1915, on account of frontal headache following an attack of grippe; pus in middle meatus of left side, tenderness over left frontal and septum much bowed to same side; treatment by alternate suction and compression begun at once; headache gone after first treatment; no pus in nose after ten daily treatments. This was an acute case, and equally as good results might have followed other forms of treatment.

Mrs. S., aged 48. Did a radical Killian on Mrs. S. eight years ago for the relief of a chronic pan-sinusitis of the left side; a Caldwell-Luc operation was done on antrum at same time; operation followed by cessation of pain and general constitutional improvement. Discharge never entirely ceased. Douching, spraying and such other procedures as can be done by a patient in her daily toilet were practiced by Mrs. S., and occasionally the various sinuses were treated at my office. She came for such a course of treatment on March 30, 1915, complaining of an increased nasal discharge and a troublesome cough. I began the alternate suction and compression treatment at once together with the autogenous vaccination. By this process the pus and muco-purulent secretion which could be gathered into the vacuum bottle measured at least one inch in height in the bottle. Cough was lessened after first treatment. Constitutional improvement was soon evident and secretion gradually diminished until today (May 25th) I have been unable to get even a show of pus or mucus in my vacuum bottle. Treatment in this case will continue for two or three weeks. I am confident of the complete arrest of the disease.

Mrs. H. M., aged 34. Has had more or less trouble with her throat since childhood. I removed her tonsils and adenoids on December 7, 1914. No complications. Good recovery. Had complained for several years of pain, especially when tired, in and about left eye. On January 25, 1915, she began seeing double. Was obliged to keep left eye closed.

I referred her to Dr. Herbert Wootton, who diagnosed a paralysis of certain of the eye muscles and advised treatment by bichloride. As this seemed to imply a specific cause for the eye symptoms, I hesitated, as I knew the father, mother, husband and son of the lady, and could not believe there was any specific taint. A Wasserman was done on her blood and spinal fluid; both negatives.

There was considerable indican in urine and the bowels were given a rigorous cleaning out. Patient remaining in bed for several days. After four or five days of bowel treatment paralysis of the eye muscles disappeared. The lady went to Florida for several weeks. Upon her return she came to see me. Has had no further diplopia, but the upper lid of the left eye drooped so much that she complained that one eye was growing smaller. For some reason I applied suction to her nasal cavities. I was surprised to get a considerable amount of muco-pus from the left side of her head and more surprised on the following day to find both eyes wide open. The treatment above described was given four or five times when she ceased to come to the office, until she came last week with her son. Asked why she had not continued treatment, she answered, "Why, I'm all right: I can now sit through an entire movie performance without pain in my eye, and I did not suppose you wanted to see me when I was all well."

These few cases will serve as types of sinus troubles that I have treated without operation. All I have treated are not well, but neither they nor I have abandoned hope of an ultimate arrest of the disease.

OBSERVATIONS UPON THE INTRA-NASAL EXENTERATION OF THE ETHMOIDAL LABYRINTH IN PAN-SINUSITIS.

BY HARRIS PEYTON MOSHER, M.D.

The fundamental points in the anatomy of the ethmoidal labyrinth to my mind are as follows: The anterior ethmoidal cells are grouped about the upper part of the unciform groove and form the ethmoidal portion of the floor of the frontal sinus. When the darinage canal of the frontal sinus has the form of a duct the anterior ethmoidal cells more or less completely surround it. An ethmoidal cell may mound into the floor of the frontal sinus (frontal bulla) or may extend transversely over the posterior part of the roof of the orbit, the anterior wall of this cell and the posterior wall of the orbital prolongation of the frontal sinus being made by a plate of bone common to both.

In the majority of cases the naso-frontal duct is not a duct. It begins as an opening in the floor of the sinus which is thickened into a ring and then becomes an antero posterior slit bounded on the outside of the inner wall of the ethmoidal labyrinth and on the inside by the extreme upper anterior part of the middle turbinate. The cribriform plate lies to the inside of the upper limit of the middle and superior turbinates. Any operative procedure carried on outside of the middle turbinate does not endanger the cribriform plate. It endangers only the roof of the ethmoidal labyrinth.

THE UNCIFORM CELL.

The unciform process springs from the anterior end of the ethmoidal labyrinth half way between its outer and inner border and starts downward parallel with the lachrymal bone. Almost at once it swells inward thus widening the space between it and the lachrymal bone. Below this swelling it swings outward and meets the lachrymal bone and fuses with it. This fusion takes place along a thin antero posterior line. Below this line of fusion the unciform process becomes narrower and twists upon its vertical axis so that its anterior edge now articulates with the lachrymal

bone along the line of the inner surface of the lachrymal crest. The two bones thus placed make a V, the point of which is anterior. This space is the unciform groove.

The cell to the inside of the upper part of the unciform process I prefer to call the unciform cell. The anterior inner edge of the upper part of the unciform process overlaps slightly the inner surface of the ascending process of the superior maxilla.

Quite often an ethmoidal cell is found on the inner surface of the upper portion of the ascending process of the superior maxilla. This is the region of the agger nasi and such a cell is called the cell of the agger nasi. The cell of course is under the attachment of the anterior end of the middle turbinate and when large it forces the middle turbinate strongly inward. This cell is often present but is not constant. The agger nasi cell is but an extension forward and to the inside of the ascending process of the superior maxilla of the unciform cell. In my preliminary paper upon exenteration of the ethmoidal labyrinth it was advised to make the initial plunge into the labyrinth through the agger nasi cell. Later it was found that owing to the fact this cell was not constant that it was better to go a little higher and a little further back on the extreme upper part of the middle turbinate.

The posterior ethmoidal cells are larger than the anterior cells and are seldom more than four in number. The ethmoidal lamella which separates the posterior from the anterior cells and from which the middle turbinate springs is easily pierced by the point of a curette. Only once in the living and twice on the cadaver has the writer found that undue force was required to pierce it. The inner wall of the ethmoidal labyrinth bows inward posteriorly, and then runs sharply outward to make the anterior boundary of the spheno-ethmoidal recess. This spreading of the posterior part of the ethmoidal labyrinth more or less completely shuts off the operator's view of the nasal or inner portion of the front wall of the sphenoidal sinus. Each half of the front wall of the sphenoidal sinus is divided into an inner or nasal portion which is free in the nasal cavity and an outer or ethmoidal part which is enclosed in the posterior ethmoidal cell. There is a common wall between the outer half of each half of the frontal face of the sphenoidal sinus and the posterior ethmoidal cell or

cells if there are two such cells. The most posterior ethmoidal cell may be prolonged backward over the top of the sphenoidal sinus or to its outer side. In the latter case it may for practical purposes be the real sphenoidal sinus for that side. If the curette is carried backward through the ethmoidal labyrinth always to the outside of the middle and superior turbinates it will surely find the posterior ethmoidal cell no matter what its variations. It is necessary for safe operating to uncover the whole of the front face of the sphenoidal sinus. This cannot be accomplished owing to the breadth of the posterior part of the ethmoidal labyrinth unless the posterior half of the superior turbinate is removed as high as possible and also when it is removed flush with the front face of the sinus. The operator must clearly see the limitations of the nasal and ethmoidal portions of the front face of the sphenoidal sinus before entering it and breaking down the anterior wall. When the ostium is not visible the best plan for securing orientation is to make sure that the head of the patient is level and then to find the upper rim of the choana and beginning here to follow up the front face of the sinus keeping close to the septum. If the probe does not fall readily into the sinus a curette may be put through the same manipulations and it will break through at the proper place.

THE SUPERIOR NASAL SPINE.

The superior nasal spine has long figured in intra nasal operations upon the frontal sinus. The names of Good and Halle come to mind at once in speaking of this point. Last year Lothrop published an operation for the relief of frontal sinus empyema the nasal procedure of which is the complete removal of the internal nasal spine.

The internal nasal spine forms the anterior inferior angle of the floor of the frontal sinus for a short space to the outside of the base of the middle septum dividing the two frontal sinuses.

INTRA NASAL OPERATIONS FOR PAN SINUSITIS.

The oldest and the most universal operation for removing the ethmoidal cells and for approaching the frontal sinus and the sphenoid intra nasally is the operation of Hajek. This consists in attacking the ethmoidal labyrinth cell by cell with hook, curette,

or conchotome, until after repeated sittings the labyrinth is thoroughly opened and an approach to the frontal sinus and the sphenoid is gained. There is no plan for the procedure, except to keep on going until you get to the end. It is a timid and tedious operation, notwithstanding the fact that it was devised by one of the best anatomists. The very strong argument can be made in its favor, however, that it does not sacrifice supposedly healthy tissue. When it is attempted by the operator who lacks anatomical training it degenerates into puttering.

BALLENGER'S OPERATION.

Ballenger's knife with which he removes the ethmoidal labyrinth en bloc is essentially a skeleton spoke shave. It might be called a cubist sickle. The manner in which the right and left knives are used is familiar to you. The knife is effective for the removal en bloc of the posterior two-thirds of the labyrinth. To my mind, its use is attended with an unpleasant crunching in the dark. I find it hard to visualize the bends of the instrument and to keep in mind where the end of it is going. Consequently I have slit the whole length of the septum in two cases. The consequences were trivial. I feel that the Ballenger method is good for quick operating. As it does not open the anterior ethmoidal cells thoroughly it must be supplemented with the use of the curette and conchotome in the region behind the ascending process of the superior maxilla. Furthermore, the operator works from behind forward, technically from the dark to the light, but in reality always in the dark.

THE WRITER'S OPERATION.

About two years ago the writer described a systematic method of exenteration of the ethmoidal labyrinth and of approaching the frontal sinus and the sphenoidal sinus intra-nasally. He stated that the procedure as an entity was new to him. He stated also that parts of it, namely, the manner of reaching the naso-frontal duct had been consciously and unconsciously carried out by other men. The operation as described, however, seemed to meet a want if the letters which have been received on the subject mean anything. Local medical gossip and at least one paper have raised the question of priority. In this affair it seems to me that I play the role, if I may be permitted the use of a

somewhat stilted figure, of a Lilliputian Morton, not that of Jackson. With this large sentence this small matter will be dropped.

I wish with your indulgence to review the operation simply and to make some comments; in so doing putting on record the answers to questions which have come to me about it.

It has been found to be good practice to begin the operation by the removal of the anterior end of the middle turbinate, which I like to call the inferior overhang. This rids the field of much debris. The initial plunge of the curette into the ethmoidal labyrinth is best made by disregarding the agger nasi cell if it is present and going higher on the superior overhang, that is the extreme upper part of the middle turbinate and a little further backward. If the curette does not readily break into the labyrinth it should be carried a little higher and a little further back. Finding this point, may bother the beginner in the operation very considerably. Once in the labyrinth the curette is turned and swept forward until it strikes the posterior surface of the ascending process of the superior maxilla. Then it is turned so that it faces posteriorly, and by backward and downward sweeps the unciform process, the ethmoidal bulla and its cells are opened. The cavity so made in the anterior part of the ethmoidal labyrinth is cleaned of fragments by using a small round tonsil punch. The operator is now ready to probe for the naso-frontal duct and to enlarge it by sounds, rasp or burr. Experience on the living and greater experience on the cadaver has shown that the posterior edge of the ascending process of the superior maxilla is in a great majority of instances a guide to the naso-frontal duct so that a probe slipped upward along its posterior border finds the sinus. In the small percentage of cases in which this manoeuver fails to locate the duct it can be found by carrying the probe backward to the limit of the roof of the operate cavity and then bringing it forward with the point turned outward. Only as a last resort should the point of the probe be turned inward.

The second part of the operation is done as follows: The head of the patient is held so that the cribriform plate is level and it is kept so. The curette is now plunged through the attachment of the middle turbinate and carried backward to the outside of the middle and superior turbinates to the front wall of the sphenoidal

sinus. This is firm and stops the instrument with a dull and sometimes, especially in the operator's first attempts, a sickening thud. The face of the curette is now turned downward and the bowl and shaft forced through the bottom of the ethmoidal labyrinth. This generally leaves the posterior half of the middle turbinate dislocated and hanging. The middle turbinate is removed by snare or conchotome as the operator sees fit. The manipulations as so far carried out have removed the lower two-thirds of the inner wall of the ethmoidal labyrinth. The upper third of this wall is left as a prominent antero posterior ridge composed in front of the middle turbinate and behind of the superior turbinate. As much of this turbinate ridge as possible should be removed. The amount of ridge left at the end of the operation measures the thoroughness of the exenteration. Whenever there is an appreciable ridge there is still a chance to remove more of the inner wall of one or more of the posterior cells. It is especially important to get this remaining portion of the inner wall of the labyrinth removed posteriorly in order to do away with the inward bulging of the labyrinth which so obscures the nasal face of the front wall of the sphenoidal sinus. On the cadaver it is easy to remove the highest portions of the middle and superior turbinates by passing the blades of a long pair of scissors about the stump and cutting backward. It makes the operation a little neater from the standpoint of description to do it in this way but in practice I have dispensed with this step and take the round tonsil punch upon which I rely more and more as an universal instrument in this operation and to frankly punch away all the turbinate overhang that I can. Even before this, that is, after the initial backward and downward curetting and evisceration of the labyrinth, the punch is used freely in the labyrinth to remove tags and to clear the front wall of the sphenoidal sinus.

When the labyrinth has been cleared out in this way the front wall of the sphenoidal sinus laid bare and its ostium located by vision, probe or curette, the operator deals with the front face of the sphenoidal sinus as he pleases, evulsing it, breaking it down with the curette or punching it away. As a final step the outer wall of the labyrinth, that is, the inner surface of the os planum is curetted from behind forward.

I usually pack the operated cavity for a short period, generally

over night. In the cases where I have not packed, packing was usually necessary later on account of hemorrhage. Many operators, however, do not pack. I confess that I am always uneasy about the packing for fear of damming back infection. As yet, in my hands, there has been no trouble from this cause.

The after treatment consists in keeping the nose clean, in removing tags wherever they are found and polypi, when, as often happens, they reappear. Besides the ordinary alkaline cleansing wash I have used only solutions of argyrol. I have been asked: "When do you consider an ethmoidal case cured and how long does it take?" The answer has been, "When pain, pus and polypi disappear." The time required before this takes place may be six weeks or six months. In answer to the question, "When do you consider that a case can be discharged from observation " I am inclined to say, "Never." Cases should report at least once or twice a year for two or three years. I do not consider that any ethmoidal or sinus case operated or unoperated is ever free from the liability of recurrence.

THE COMPLICATIONS OF THE OPERATION.

In two years two patients have died of meningitis as the result of the operation in Boston. In the first case which happened the first year of the operation the ethmoid was exenterated for chronic ethmoiditis with polypi. In probing the posterior ethmoidal cell for purposes of orientation the probe entered the cranial cavity. In the second case, which occurred last year, the operator entered the orbital cavity far back on the os planum. It is not uncommon to enter the orbital cavity anteriorly in the region of the lachrymal bone. This accident, however, results only in a black eye and is usually trivial in its consequences. I have had one abscess from this cause at the inner canthus of the eye. When the pus was evacuated no further trouble was experienced by the patient.

I myself have not yet had a death, but may have one at any time. Ethmoidal operating, which deserves the name, always has been dangerous and always will be.

RESULTS OF THE OPERATION.

My series of cases fall far short of the classical hundred. All that I can say about my results is that this method of operating

has given me for the first time confidence in this field. My results are therefore naturally better than I have had before. I have already indicated how I feel about the possibility of curing ethmoiditis and sinus diseases. For the first weeks after what appeared at the time to be a thorough exenteration of the ethmoid it is most disappointing to look into the nose. The operative reactions makes it seem as but little had been done. Furthermore even after the reaction has subsided, yes even a year afterward, I have had cases in which it seemed as if pitiably little had been accomplished in the matter of obtaining a permanently large cavity in the labyrinth. I do a little better each time but perfection is still, and probably always will be, far away.

OPERATIONS UPON THE NASAL SPINE.

For four or five years between them Good and Halle have been removing the nasal spine, the first with a rasp and the second with an electrically driven burr. Last year Lothrop extended the procedure by taking away the upper anterior part of the septum and then with a hand burr removing the nasal spine as a whole, not merely one-half of it as the other men had done. In accomplishing the complete removal of the spine he takes away the median partition which divides the two sinuses, making the diseased and the healthy sinus communicate freely. The end of the burr is guided and controlled by a small opening made in the front wall of the diseased sinus. Guiding the burr by sight seems to me a step forward. Using the burr in the dark after the method of Halle has never appealed to me. This operation of Lothrop's is for the most part executed intra-nasally. Therefore I bring it up here. The author puts it out as a rival of the Killian operation. He claims good results in fifteen cases operated upon during the last year. This of course is far too short a time to tell what the results are of any sinus operation. The usual three years, which is customary before malignant disease is rated as cured, in my opinion is none too long for sinus disease. Operators have so persistently endeavored to enlarge the naso-frontal duct by removing a portion of the nasal spine that I feel that if it is accomplished by sight as in the Lothrop method, the procedure has a future ahead of it. In small sinuses the method of removing completely the nasal spine as well as the median septum

of the sinus rather appeals to me provided the anterior ethmoid cells are dealt with at the same time. That the operation will displace the modified Killian operation in large sinuses I doubt. Lothrop could speak with more authority in this matter if he ever had had any experience with the Killian operation. If I am correct he has never done one. He has, however, re-operated cases of other men where the Killian procedure has been tried and recurrence followed. This would seem to be proof of the superiority of his procedure were it not for the fact, and I say this in all charity, because I need a great deal myself, that a Killian operation to deserve the name should be done with more anatomical knowledge and more thoroughness than is often the case. All sorts of incomplete procedures have been glorified with the name of a Killian operation.

INTRA NASAL OPERATION UPON THE ANTRUM.

A discussion of intranasal operations for pan sinusitis of course should deal with the numerous methods of opening the antrum from the nose. As the title of this paper shows, it does not aspire to be complete and on this point it will be very incomplete because intra-nasal operating upon the antrum has never appealed to me. I have never seen the advantage of peeking into an antrum more or less round a corner and so have preferred in all chronic cases to expose the cavity by the canine fossa route. If I should turn to any form of intranasal operating I should naturally choose the operation which gives the largest field. This would mean that I should choose between the Sluder technique and some form of the Denker operation. One case of mine (although, of course, one case does not mean much) interested me a good deal. In this on one side a Denker operation was done from the canine fossa, and on the other a typical canine fossa operation. The latter scabbed less and cleaned up quicker than the Denker.

The patient of a colleague had an embarrassing experience after a Denker operation. For a considerable time she had no control over the secretion of the antrum. When dancing or when at table there would be a sudden gush of mucus from the nose if she chanced to bend her head forward. The embarrassing complications of such a happening are self-evident.

THE FRONTAL SINUS: OPENING IT THROUGH THE NOSE FOR CHRONIC SUPPURATION.

BY OTTO T. FREER, M. D.

As late as 1905 prevalent opinion regarded the intranasal opening of the frontal sinus as too dangerous and difficult a feat to be attempted. Not disheartened by this discouraging view E. F. Ingals, Max Halle, Vacher, H. P. Mosher and lately P. Watson Williams and Herbert Tilley have by persistent effort and study proved anatomically and clinically that the frontal sinus may be opened for drainage and ventilation through the nose with a reasonable degree of safety, the hazard being reduced to about that of the external frontal sinus operation.

In the following article the views dominant to-day are considered together with original observations. I wish here to thank Professor Basil Harvey, of the department of anatomy of the University of Chicago for the opportunity he has granted me for the anatomical study of the subject.

ANATOMY.

A description of the surgical anatomy of the frontal sinus must necessarily include that of the anterior ethmoid region. Both the sinus and its ethmoid neighborhood present numerous well-known abnormalities such as absence of one or both frontal sinuses, minuteness or excessive size of a sinus, coalescence of both sinuses into one, or of the ethmoid cells into large simple cavities, and the existence of a large frontal bulla (Fig. 1) arching over the orbit. These abnormalities would make the operation most hazardous were it not that the X-ray gives exact information in regard to position and size of the frontal sinuses and were it not that the constancy in structure of the confining boundaries of the way up to the frontal sinus from the nose, the turbinal plate, the lamina papyracea, the lachrymal bone, the ascending process of the superior maxillary bone and the orbital plate of the frontal bone makes less important variations in the arrangement of the anterior ethmoidal cells, which are to be

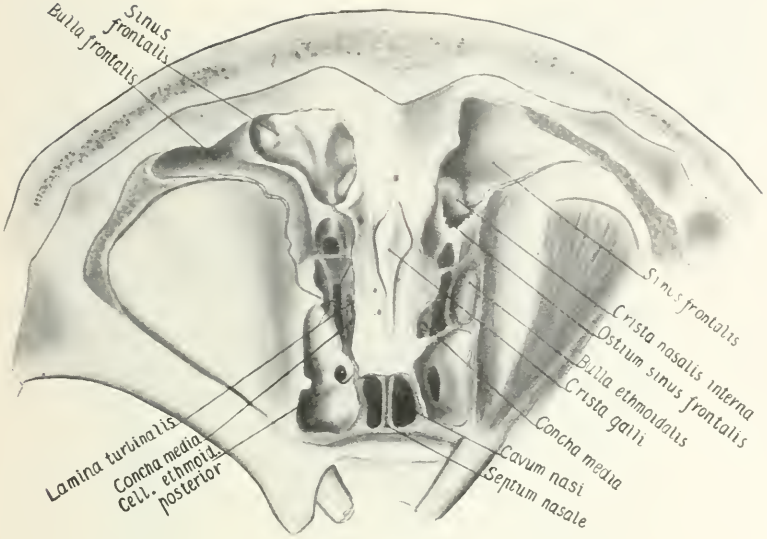


Fig. 1

The floor of the anterior cranial fossa has been removed showing the orbits, frontal sinuses and ethmoidal tracts opened from above. The periorbita has been left over the left orbit; the ocular bulb is exposed in the right one.

cleared away at any rate in the operation. In addition, Hajek's fundamental lamellae, the uncinate process, the bulla lamella and the middle turbinate lamella, are always present to guide the operator, unless removed by previous operations.

RELATIONS OF THE FRONTAL SINUS OSTIUM.

Looking at most examples of the detached frontal bone the openings of the frontal sinuses, though varying in size, are seen to be quite large enough for drainage of pathologic products. (Fig. 2.) The apposition of the ethmoid cells, however, besides providing a narrow and easily blocked outlet for the sinus, the fronto-nasal duct (Fig. 3) fills in the naturally wide frontal sinus opening in the frontal bone, (Fig. 4B) reducing it to the typically small ostium (Fig. 4A) which is the entrance from above into the fronto-nasal duct. The ostium does not lie in the plane of the frontal bone opening, but at a lower level, at the bottom of a funnel formed by the walls of the anterior ethmoid cells and by

the internal angular process (internal nasal crest) (Fig. 1, Fig. 3) of the frontal bone, which converge to form the floor of the sinus about the ostium. Normally the ostium is bounded in front by the hard projection of the internal angular process of the frontal

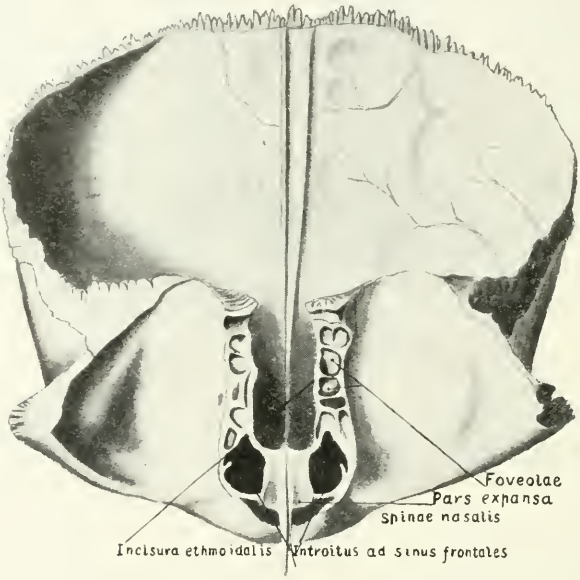


Fig. 2
(After Gray.) The frontal bone, showing its orbital surface.

bone. Exceptionally an anterior ethmoid cell intervenes between the ostium and the nasal crest, displacing the ostium farther back. (Fig. 4.) Externally and posteriorly an ethmoid cell or cells lie between the ostium and the orbit.

Backward from the ostium extends the entire chain of anterior and posterior ethmoid cells, (Figs. 1, 2, 3, 5, 6) which beginning in front with the bulla ethmoidalis or a cell in front of it ends behind at the sphenoid sinus. The uppermost of these cells are incomplete in the ethmoid bone and are completed in the articulated skull when roofed by the innermost portion of the orbital plate or process of the frontal bone, (Fig. 6) which borders the ethmoid notch (incisura ethmoidalis) (Fig. 2) and which is

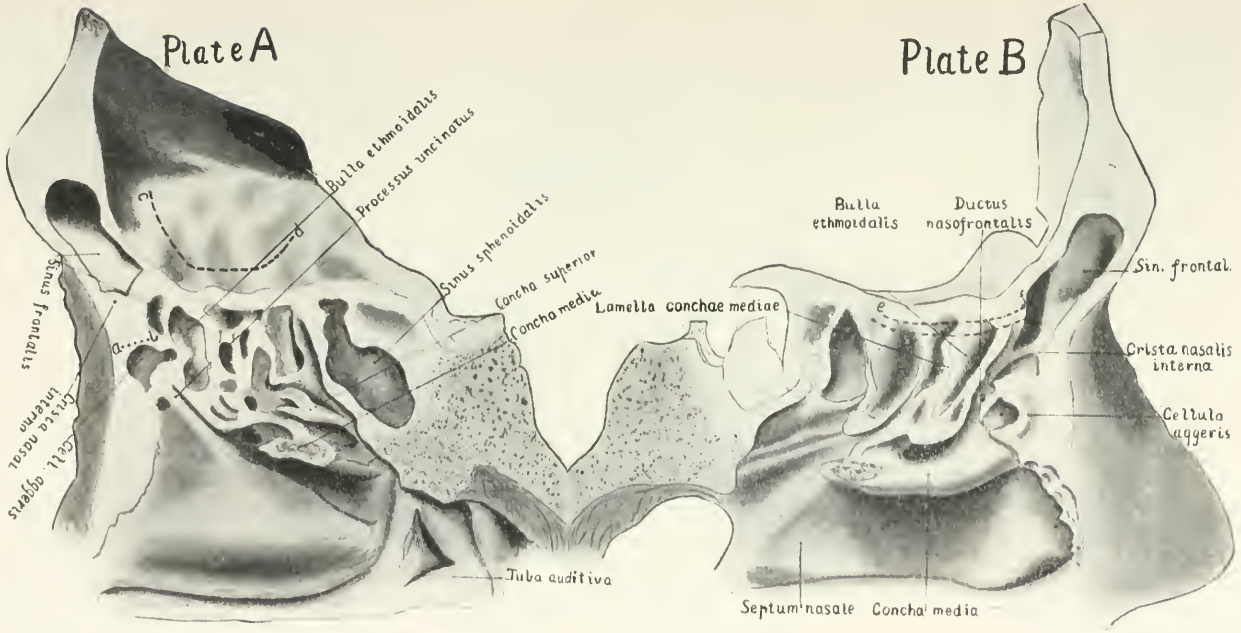


Fig. 3

A saggital saw-cut through the ethmoid cells, showing the surgical passage of approach laid open. In plate *A* is seen its outer wall with the lamina papyracea at the bottom of the ethmoid cells displayed; in plate *B* is seen the turbinal plate ending below in the middle turbinate whose under surface is shown together with the fronto-nasal duct leading up into the frontal sinus. *A, b*, level of ostium of frontal sinus; *c, d*, line of demarcation between the ethmoid cells and orbit; *e, f*, level of cribriform plate.

marked by depressions or foveolae (Fig. 2) which fit over the open ethmoid cells. For this reason I refer to these cells as foveal cells.

There is some confusion as to what bone forms the roof of the lateral mass of ethmoid cells and they are often spoken of

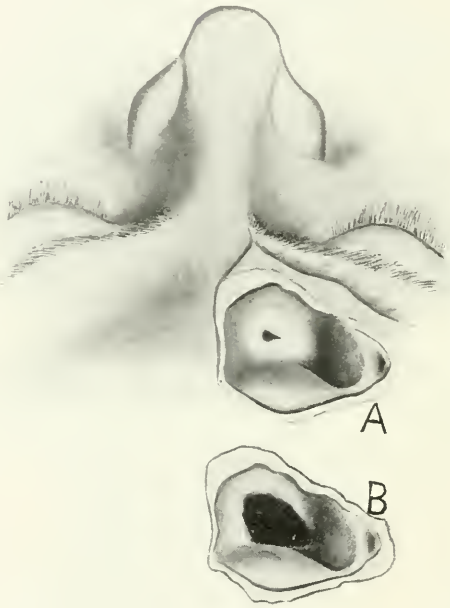


Fig. 4

Part of the face of a cadaver seen from above and behind the head, the observer looking down into the opened frontal sinus showing, *A*, the ethmoidal cell part of the sinus floor intact with the ostium; *B*, the same sinus after the ethmoid cell part of its floor has been removed from above with the author's frontal sinus curettes.

as being covered by the cribriform plate. In viewing the detached frontal and ethmoid bones it is obvious that the cribriform plate forms merely the floor of the olfactory fossa (Fig. 6) and that it is the orbital process of the frontal bone which covers the ethmoidal cells above as a roof or tegmen which separates them from the cranial cavity. (Fig. 6.)

Internally the ostium is bounded by the expanded plate of the anterior superior nasal spine of the frontal bone (Fig. 2) and the

turbinate wall of the ethmoid bone. The posterior part of the inner wall of the ostium funnel is usually the thin part of the orbital process of the frontal bone which bounds, in front, the olfactory fossa, whose floor is formed by the cribriform plate. (Fig. 6e). Where the cribriform plate extends well forward it causes this thin part of the orbital plate to project forward

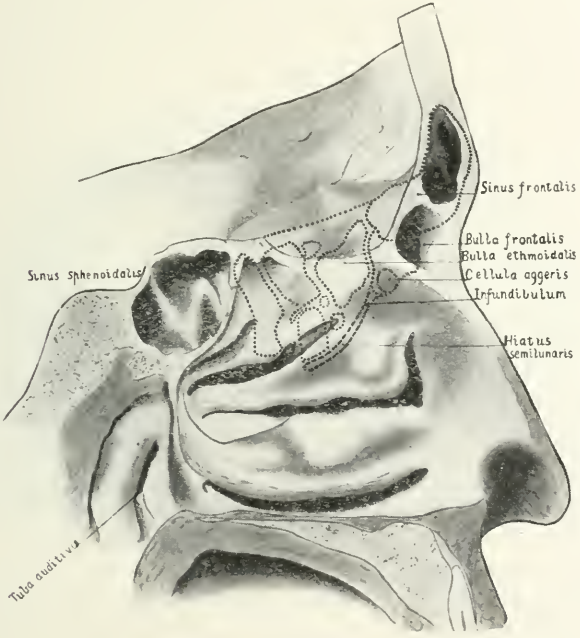


Fig. 5

Lateral view of a nasal fossa. The location of the ethmoid cells and infundibulum and their relation to the turbinates was exactly marked by drilling from a sagittal saw cut toward the nasal interior.

into the frontal sinus as a vertical crest (crista olfactoria of Boenninghaus) or as a more marked prominence (torus olfactorius of L. Onodi, Archiv für Laryngologie und Rhinologie, 1913, page 128).

The torus region is the most dangerous surgically in the circumference of the frontal sinus ostium as perforation or fracture, opening into the cranial cavity just above the cribriform

plate, may readily be made here. It is not therefore, as stated by Herbert Tilley, the cribriform plate itself that is most endangered, but the thin part of the orbital plate above it referred to.

It is thus seen, in considering the boundaries of the ostium of the frontal sinus that it is most easily enlarged directly posteriorly along the row of foveal cells mentioned, for these frail cell walls are readily broken down. Externally, too, towards the region of the lachrymal bone an ethmoid cell or two may usually

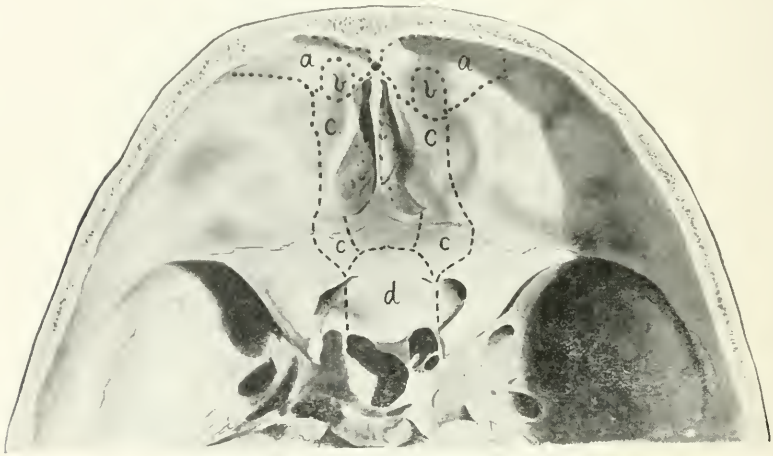


Fig. 6

View of anterior cranial fossa showing *a*, *a*, the extent of the frontal sinuses; *b*, *b*, the location of their ostia; *c*, *c*, the rows of foveal ethmoid cells on either side of the olfactory fossa whose floor is the cribriform plate; *d*, the sphenoidal sinuses, opened from above in the sella turcica.

be removed, giving additional space and an accidental perforation into the orbit so far forward would not be serious.

Internally, towards the septum interfrontale, it is unsafe to cut as a possible projection forward of the olfactory fossa may have created a torus olfactorius in this region.

Enlargement in the anterior direction, being regarded as the safest is favored by rhinologists in spite of the hardness of the bone of the internal nasal crest and the need of powerful instruments to cut it, the most used being the rasp. However, the rasp is liable to fracture an overhanging posterior frontal sinus wall

against which it may be violently driven in its forcible up and down motions in the confined space of the sinus. I have been informed of one death from meningitis following its use. The forcing upward of a large burr might also injure the posterior wall, but properly used it is a safe instrument.

The amount of space gained in enlarging the ostium forward will depend upon the prominence of the internal nasal crest removed and the possible, but very rare presence of an ethmoidal cell hollowing the crest in front of the ostium. Usually the space obtained is insufficient of itself for drainage, especially as it becomes largely lost because of the formation of cicatricial bands which replace the mucosa destroyed by the rasp or burr.

While the possible enlargement of the ostium forward is, as shown, usually moderate, a great increase in its size is obtained by removing the foveal cells backward from underneath the orbital plate forming their roof; no powerful instruments being needed, but merely light curettes of adapted form. (Fig. 7.) This procedure removes the natural obstacle to drainage, the anterior ethmoidal cells, and opens the frontal sinus ostium to the full capacity of the opening in the detached frontal bone. The enlargement is made not in the foremost, narrowest part of the naris, as in cutting forward, but in a capacious part of it. Another advantage is that, as P. Watson Williams says, remnants of mucous membrane in the opened ethmoid cells act as islands from which the reproduction of the mucosa may proceed, giving the outlet obtained, a mucous membrane lining, so eliminating the tendency to cicatricial contraction. The enlargement of the ostium in the posterior direction is the one which the surgeon naturally adopts as the proper and most effective route when opening a way from the sinus into the nose in doing the external operation. Working from above downward into the nose in a safe direction and where he can see plainly what he is doing, he does not hesitate to clear away the ethmoid cells which obstruct the way from the sinus into the nasal cavity. These cells are the foveal cells mentioned and a drainage tube introduced in such cases is always seen lying high up in the nasal cavity under the orbital plate in the place of these cells after their destruction. Working from below up the fear of injuring the brain or eye

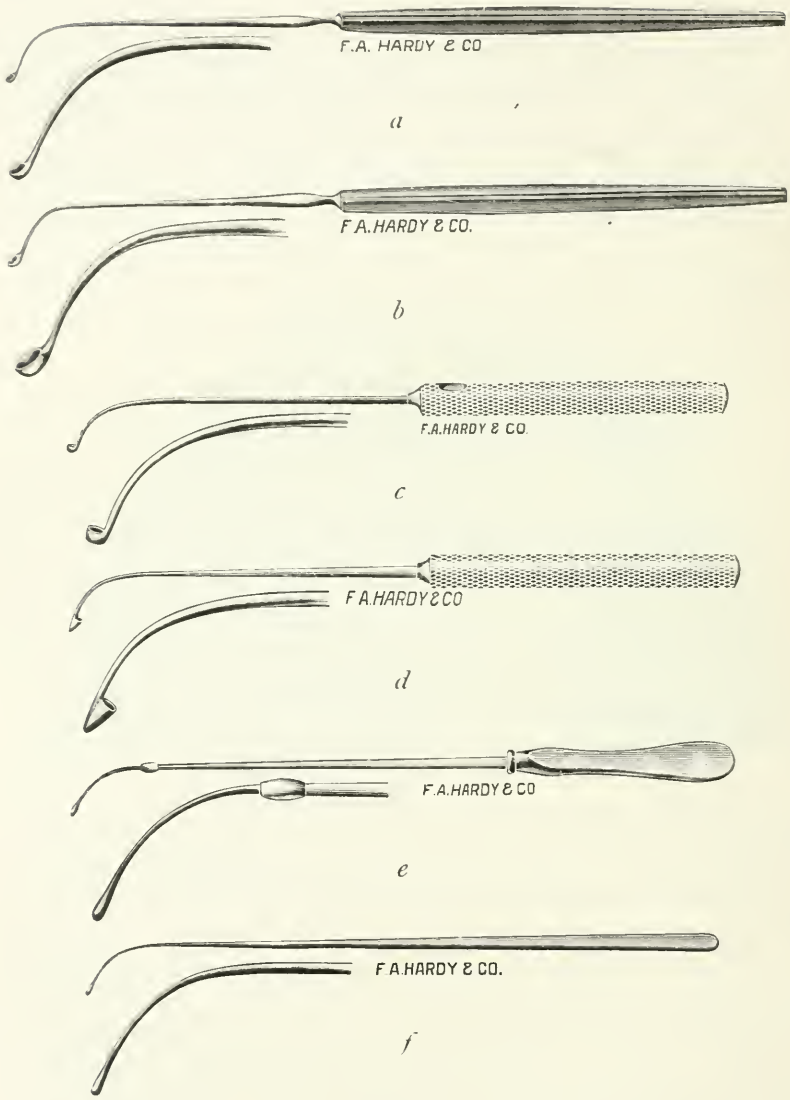


Fig. 7

a. Freer backcutting frontal sinus probe curette; *b*, larger size of same curette; *c*, backcutting ring frontal sinus curette; *d*, forward cutting frontal sinus curette; *e*, frontal sinus probe with steel shank and copper end; *f*, copper frontal sinus probe.

makes those unfamiliar with the anatomy of the region cut away the nasal crest only, so gaining little space while the far more obstructive ethmoid cells are not removed.

THE OPERATIVE FIELD.

Looking from above into the anterior cranial fossa the cribriform plate is seen forming the floor of the more or less deep olfactory fossa (Fig. 6e), which is divided sagitally by the crista galli into two parallel oblong excavations which are shallow behind but grow narrow and deep towards their front where they end against the posterior wall of the frontal sinus to the inside of its ostium. The walls of the olfactory fossa are formed from the orbital plate of the frontal bone, rising gently from the edges of the cribriform plate behind and more and more steeply towards the front, so that they may actually overhang the olfactory fossa along its anterior half. After thus ascending from the cribriform plate in walling in the olfactory fossa the orbital plate bends over to a horizontal level on each side of the fossa in order to cover the foveal row of cells mentioned, rising thence again rather steeply to form the irregular domes that roof the orbits. The portion of the orbital plate covering the foveal cells is usually about ⅜ of an inch wide. (Fig. 6, c,c.) A posterior extension of the frontal sinus in the form of a recessus paracribrosus of L. Onodi, may displace the foremost foveal cells backward .

In very many cases the foveolae of the foremost one or two ethmoid cells, instead of remaining mere depressions along the border of the ethmoid notch of the frontal bone, become cavities penetrating the orbital plate of the frontal bone in the form of fronto-ethmoidal cells which arch outward more or less over the orbit. (Fig. 1.) The foremost cells as a frontal bulla may thus extend outward even beyond the frontal sinus and greatly exceed its capacity, forming what looks like a second frontal sinus behind the usual one. (Fig. 1.) In these not uncommon cases the orbital process of the frontal bone is divided by the fronto-ethmoidal cells into two lamellae, one arching over the eye and the other over the large fronto-ethmoidal air cells. Beyond intranasal drainage such cells are beyond surgical interference if suppurating.

The portion of the orbital process of the frontal bone covering the anterior ethmoid cells is continuous with the posterior cranial wall of the frontal sinus with which, seen in profile, (Fig. 3) it forms a sweeping curve, and in clearing away the obstructing ethmoid cells in opening the sinus the curette follows this curve. Although thin, this cranial covering of the ethmoid cells is of very hard, firm bone and, unless directly attacked in operating, it is in no danger of perforation, unless carious. A curette of proper form sweeping away cell partitions backward from underneath it will not penetrate it but may be felt to glide over it. As mentioned the curette should not be directed inward because of danger of cutting through the wall of the olfactory fossa or a torus olfactorius as the bone is usually thinnest here. From Figs. 3, 5 it is evident that where the cell partitions are cleared away under the orbital plate a wide space is established from the middle meatus of the nose up into the frontal sinus.

The outer wall of the operative field is the lachrymal bone in front and the lamina papyracea of the ethmoid bone behind it. This, the orbital wall of the field, is often frail and is liable to perforation if instruments are directed too far outward and used with pressure. I have heard of two perforations of the orbit occurring in operations upon the ethmoid cells, one resulting in orbital abscess and the other in an intraorbital arterial hemorrhage with immediate exophthalmos. Blindness of the eye involved occurred in both cases. In a third case the perforation took place in the lachrymal region with no bad results.

Inwardly the operative field is bounded by the turbinal wall (Figs. 1, 3, 5) of the ethmoid labyrinth which is continuous above with the lateral wall of the olfactory fossa above the cribriform plate, so that a fissure created in the upper part of the turbinal wall might enter the cranial cavity or into the cribriform plate. The turbinal wall terminates in the middle turinate below. P. Watson Williams speaks of the turbinal wall simply as the "vertical plate." This is confusing as the perpendicular plate of the ethmoid bone is also spoken of as the vertical plate and it is better to use the distinctive and descriptive term, turbinal wall, employed by Hajek, as this wall gives rise to both the superior and middle turbinated bodies.

THE INTRANASAL APPROACH TO THE FRONTAL SINUS.

The often described narrow and often tortuous anatomical way from the nose to the sinus, the nasofrontal duct and infundibulum, (Fig. 3) ascends underneath the middle turbinated body among anterior ethmoid cells to the sinus ostium. The broader surgical passage of approach lies between the parallel walls mentioned, the inner orbital wall and the turbinal plate of the ethmoid bone and ignores the ethmoid cells in the way. The space between these walls, which I call the surgical passage of approach, extends antero-posteriorly from the ascending frontal process of the superior maxillary bone in front, to the lamella of the middle turbinate in the ethmoid labyrinth behind, (Fig. 3) this lamella separating the operative field from the posterior ethmoidal cells. In its narrowest part the passage of approach is from ¼ to ½ of an inch wide. P. Watson Williams says, "The width of this potential passage between the outer and inner boundaries at its narrowest part measures in the adult 7 to 12 millimeters. The width of instrument needed to clear the space should not exceed 6 millimeters."

The lower limit of the passage of approach is indicated by a line drawn through the bottom of the bulla ethmoidalis and just below the agger nasi, the floor of the bulla forming the lowest part of the ethmoid labyrinth. (Fig. 3.)

The roof of the passage of approach to the frontal sinus, the orbital plate of the frontal bone, has already been described.

The operative field, situated in the highest, narrowest part of the nose, (Fig. 5) close to the brain and eye, is often made still more inaccessible by conditions blocking its view. The commonest of these is an horizontal deflection outward of the lower border of the perpendicular plate of the ethmoid bone, which with the cartilage of the septum creates an angle that not only hides the operative field but even the middle turbinate. Nevertheless breathing through the naris may be good, so that such deflections must be resected for the sole purpose of access to the frontal sinus.

Other conditions making access to the operative field difficult are a middle turbinate closely applied to the outer nasal wall and

a high narrow naris in which the middle turbinate, closely held between the septum and ethmoid labyrinth, lies so far up that the operator sees only its lower border.

THE OPERATION—PROBING THE FRONTAL SINUS.

The first step in the intranasal frontal sinus operation, however performed, is the introduction as a guide of a probe into the sinus, either by the natural passage or, if this be impossible, after clearing away obstructing ethmoid cells. H. P. Mosher's study of the applied anatomy of the ethmoid labyrinth is epoch making because it showed that almost any frontal sinus may be entered with a probe if the anterior ethmoid cells are systematically removed as indicated by their anatomical relations. Previously to Mosher's exposition, failure to probe the frontal sinus by the natural passages made the intranasal operation impossible.

The probe may find the lower ostium of the fronto-nasal duct in the infundibulum, such an ostium being called ostium infundibulare by Boenninghaus, or the ostium may lie in front of the infundibulum opening into the recess extending upward under the middle turbinate towards the frontal sinus and called the recessus frontalis by Gustav Killian. In this case the ostium is called ostium recessuale.

Hajek says that the chief obstacle to probing the frontal sinus without preliminary removal of the middle turbinate is the deflection of the probe's direction outward towards the orbit by the lower border of this turbinate, so that incautious pressure upon a stiff probe in this direction may even penetrate the orbit. He says that for this reason, in the majority of cases, a previous resection of the anterior part of the middle turbinate is needed to make probing possible, and that even then there is a tendency to let the upper border of the inferior turbinate direct the probe too far outward. This outward direction is also liable to lead the probe into an infundibular cell instead of the sinus.

I have found that the frontal sinus probes in common use are not well suited to their purpose. An efficient probe should thicken evenly like a trout rod from its distal end towards its butt, so that while its distal end will retain a bougie-like flexibility, its stem will possess sufficient elastic firmness to control its tip.

Copper is the best metal. A soft silver probe gives no control of the tip, as the attempt to push it ahead bends the shank at the least obstacle. The stiffness of the spring tempered steel probes makes them dangerously liable to perforate the orbit while their inflexibility prevents their adapting themselves to tortuous canals. It is well to have several probes. A fairly limber one of copper, a stiffer one of soft untempered steel and a probe with a stiff steel stem which ends in a flexible copper tip. I have designed three probes of these materials. (Fig. 7.)

After an attempt has been made to pass the probe through the natural passage into the sinus the operation proper is begun.

The method of commencing varies with different operators. Mosher breaks into an anticonchal, infundibular cell, which he calls the agger cell (Fig. 3, 5) and which lies under the agger nasi, or as Herbert Tilley says, in the anterior, superior third of the uncinate process. Mosher found that in most cases he could pass from this cell, when opened, up into the frontal sinus, that is, as I have found it, destruction of this cell breaks into the frontonasal duct from in front and below. (Fig. 3.) By opening the agger cell, Mosher severs the attachment of the middle turbinate in front, making it movable. He preserves the middle turbinate. Mosher's entrance through the agger cell into the ethmoid labyrinth involves cutting through the turbinal plate high up, so near the cribriform plate that a possible fissuring fracture created by the curette used might penetrate the cranial cavity, as is evident from Mosher's drawing on page 886 of the Laryngoscope for September, 1913, and from the illustration showing the agger cell in this article. (Figs. 3, 5.) P. Watson Williams says: "With an infective purulent discharge we should avoid opening up a bare tract so close to the cribriform plate and I always keep intact the upper part of the vertical (turbinal) plate which is the first part that Mosher destroys." The occasional absence of the agger cell and its tendency to have strong walls demanding force for its penetration are further objections to Mosher's point of entrance to the operative field.

P. Watson Williams begins his operation by cutting through the anterior margin of the middle turbinate where it is attached to the outer nasal wall, with forceps; this, he says, cutting

through, enters the anterior ethmoidal cells in front of the frontonasal passage. It has not been my experience that this entrance may be relied upon. Herbert Tilley removes the anterior part of the middle turbinate. Boenninghaus resects the anterior part of the middle turbinate including the pars fixa, that is, the part that covers the recessus frontalis. He says that the middle turbinate resection and uncinate process resection which he performs often open a cell and show the way into the sinus.

Max Halle cuts through the anterior attachment of the middle turbinate, but preserves the turbinate entire.

I have found that in a wide naris not infrequently the middle turbinate flanges out so much towards the septum that the entire middle meatus, with the bulla and uncinate process, lie in plain view and that in such cases not only probing, but the entire operation may usually be done without cutting even the anterior attachment of the middle turbinate.

Where the olfactory fissure is wide, but the middle turbinate is closely applied to the outer nasal wall, cutting through the anterior attachment of the turbinate, as is done by Mosher, Williams and Halle, will permit a broad exposure of the infundibular region by pushing the turbinate over against the septum, but in a high narrow naris, where the middle turbinate fits in snugly between the septum and the infundibular region, the loosened turbinate can not move towards the septum and in such cases it is necessary to cut away the anterior half of the turbinate, to expose the infundibulum. It is thus evident that according to conditions it may be best to leave the middle turbinate intact, cut through its anterior attachment or resect it more or less extensively before probing the sinus.

If probing has proved unsuccessful it should be again attempted after the middle turbinate has been freed or partly removed. The probe, when introduced, is a valuable guide as to the location of the bulla and uncinate process. Whether the probe may be passed or not, the next step of the operation, the removal of the anterior ethmoid cells up to the sinus floor, is begun.

REMOVAL OF THE ANTERIOR ETHMOIDAL CELLS.

The objections to Mosher's entrance into the ethmoid labyrinth through the anticonchal agger cell have been stated. I have found

it preferable to begin the removal of the ethmoid cells with the bulla ethmoidalis. The bulla, (Fig. 3) being formed of one of the fundamental ethmoid lamellae (Hajek) is never absent, unless removed by a previous operation. Whether single or partitioned it, to quote Boenninghaus, "reaches high up to the roof of the ethmoid cells and offers the surest way to the sinus frontalis." The bulla is a large, usually prominent cell easy to find just behind the uncinate process, where it lies in a broad accessible part of the naris. Its walls are usually readily broken in with the curette and it has this great advantage as a starting point, as compared to the agger cell that, because it forms the lowest part of the ethmoid labyrinth, entrance into it may be effected through its bottom with direction of the curette forward and obliquely upward and outward instead of directly outward towards the orbit as in the case of the agger cell, whose often thick wall is inclined to make the curette enter it with plunging force, aimed at the orbit. Before entering the bulla it may be necessary to more fully expose it by resecting the processes uncinatus, by means of my septum knives. Boenninghaus resects it as a part of the regular procedure.

Having entered the bulla the curette is turned forward and sweeps away the anterior ethmoidal cells clear to the ascending process of the frontal sinus. This forward direction of the curette is also an advantage over cutting backward from the agger cell, for it is a safe direction which permits vigorous work, as it aims at the strong bone of the ascending process and internal nasal crest instead of the fragile posterior ethmoid cells with their intimate relation to the optic nerve. (Fig. 1.) The complete removal of the anterior cells from the bulla forward gives the maximum passage obtainable between the orbital and turbinal walls limiting the operative field. The operator must maintain a strictly postero-anterior direction, using as guides the inner canthus of the eye, the ascending process and an outline of the frontal sinuses drawn in ink upon the patient's forehead from the X-ray plate, which must always be taken as a preliminary to the operation.

The curette employed for this part of the work is a ring curette

which cuts with the use of less force than the sharp spoon, as it has a knife edge.

As shown by Mosher, the clearing away of the anterior cells at once admits the probe into the sinus. During their removal fresh attempts should be made to pass the probe in cases where it will not enter at first, as its shining stem guides the curette up to the sinus.

Finally remnants of cells are cut away with the Grünewald punch.

In extensive hyperplastic ethmoiditis all of the usual landmarks are absent. Here there is no bulla, no uncinate process, no hiatus semilunaris, no agger cell, the ethmoid labyrinth having degenerated into a formless mass of polypi and fragments of cell walls. Even the middle turbinate may have melted away in the process of rarifying osteitis. Chronic frontal sinus suppuration is often associated with this polypoid destruction of the ethmoid cells but fortunately, in these cases, the removal of the polypi with punch and curette also extirpates the diseased labyrinth so completely that, if the curettage be carried well forward and upward, a broad way is usually opened into the frontal sinus.

SECOND STAGE OF THE OPERATION, ENLARGEMENT OF THE SINUS OSTIUM.

In most cases the removal of ethmoid cells, as described, at the same time breaks away the posterior ethmoid cell part of the frontal sinus floor, (Fig. 4B) so establishing at once a good opening into the sinus and permitting the entrance into its cavity of rasps, burrs or curettes as desired. Not seldom, however, the sinus floor is not only hard and firm in the region of the internal nasal crest, but also, because of the thickness of cell walls taking part in its formation, it forms a hard plate all around the ostium (Fig. 4A) so that, while the ostium will admit a probe, the top of the curette used in removing the anterior ethmoid cells strikes vainly against the firm sinus floor instead of passing through it up into the sinus. For such cases I have devised a probe curette (Fig. 7) a minute sharp spoon which, passing like a probe through the ostium into the cavity of the sinus, when withdrawn cuts its way out downward and backward, making room for the introduction

of a larger down and back-cutting curette of the same form, (Fig. 7) which cuts away all of the ethmoidal cell part of the sinus floor and removes remaining cell walls from under the orbital plate of the frontal bone, so establishing a large opening into the sinus and making of the posterior sinus wall and the roof of the ethmoid cells a single sweeping curve. (Fig. 3.) These curettes have been designed after much experiment and improving change of form. They glide with perfect adaptation downward and backward under the hard orbital plate roof of the anterior ethmoid cells, merely attacking what projects from it without endangering it. They cut in a safe direction, downward and backward out of the interior of the sinus into the nasal cavity, as in the external operation. To work upward from below into a sinus of this kind with hard floor by means of rasp, curette or burr is not so safe, as it is possible to go astray and also to endanger an overhanging posterior sinus wall by plunging of the instrument into the sinus through the sudden yielding of the resistance of its floor.

In cutting out from the sinus the curette must not be directed inward towards the septum interfrontale for the reasons given.

In addition to the back cutting curettes I have designed one which has its edge directed downward and forward to cut away a possible cell lying between the ostium and internal nasal crest. (Fig. 7.)

When the cutting out from the sinus with the curettes is finished they will be found to have established a communication between the sinus and nasal cavity of much larger caliber (Fig. 4B) than could be gained by cutting forward only with rasp or burr. In this connection I quote P. Watson Williams, "In the majority of cases I have not found it necessary to reduce the nasal crest with rasp or burr, the simple removal of the fronto-ethmoidal cells and in some cases biting off of a thin projecting anterior margin of the ostium affording easy passage for a 6-millimeter bougie."

Nevertheless, cutting away of the internal nasal crest with the burr may prove indispensable in the occasional cases where the crista nasalis interna projects so far backward at an acute angle that but a narrow space is left between it and the roof of the

ethmoidal cells. The condition may make backward curettage insufficient as the removal of the ethmoid cells in such a case does not give enough space. A straight burr, such as one of Halle's cylindrical ones, is introduced in the track of the probe which should be withdrawn as the burr takes its place.

Supposing the anterior ethmoid cells removed, the place where the ascending stem of the introduced probe is lost to view in looking upward and backward under the dorsum nasi is the posterior surface of the crista nasalis interna and the burr should be introduced here to a slightly higher level than the crista and pressed forward against it before turning on the power.

This precludes injury to the posterior sinus wall. The burr should not be pushed upward while it is cutting lest it cut into the posterior wall of the sinus. A guard is not necessary, there is little room for it and it complicates the act. Halle no longer uses a guard for his new operation but has the ends of his burrs polished. The burr should fit in a dental handpiece, not a heavy surgical one which hinders fine work.

I do not deem a special set of bougies, to determine the size of the opening made, necessary. The amount of free motion of the stem of the curette in the opening will indicate sufficiently whether it be large enough.

Max Halle, in the Archiv für Laryngologie und Rhinolgie, 1914, page 731, fully describes his now completed method of opening the frontal sinus intranasally, which, he says, opens the sinus so freely that every bay and niche of its interior may be inspected as freely or more so than in the external operation.

Halle makes a mucosa-periosteum flap whose outline begins along the roof of the nose as high up as it can be placed. Posteriorly this dorsal incision is joined by one forming an arc looking backward that sweeps over the ascending process of the superior maxillary bone around the anterior attachment of the middle turbinate and ends below this attachment in the middle meatus. The incision along the dorsum nasi extends forward as far as the apertura piriformis, where it descends posteriorly and downward a little above and along the apertura. This flap is reflected downward and backward. Then Halle cuts through the anterior attachment of the middle turbinate and chisels off the agger nasi and

a part of the ascending process of superior maxillary bone. This gives a free access to the ethmoid cells and to the sinus above after the anterior ethmoidal cells are removed.

P. Watson Williams sees no advantage in Halle's flap, which he finds worse than useless except in cases where it is necessary to shave down an inward projecting edge of the superior maxilla.

I have performed Halle's flap operation upon the cadaver but did not gain enough space to make the procedure seem worth while. Halle's illustrations of the operation showing a naris opened from the side, of course show a very open operative field, but it must be considered that with the septum in place no such access is obtained in the high narrow part of the nose involved.

Nevertheless upon further trial the new Halle operation, which is the ultimate development of his large experience, may prove to be of value where maximum intranasal access to the frontal sinus is needed as, for instance, for the removal of polypi from the sinus interior, but it is unnecessarily radical for the usual case of chronic frontal sinuitis.

Halle claims as a merit of his open field that he can curette away the mucosa of the sinus as if he were curetting out a uterus. Herbert Tilley also curettes away what he calls the pyogenic membrane, which is of course the mucous membrane. The extreme pathologic changes in the mucous lining of chronically suppurating frontal sinuses or maxillary antra, described in text books, such as excessive hypertrophy, polypoid degeneration, ulceration with exuberant granulation, have been generally regarded as the rule with a consequent demand for destruction of the mucosa in all cases, as hopelessly degenerated. At first I was also under this impression, but experience has shown me that not only are these advanced degenerations exceptional but that the mucous lining of these sinuses is usually normal in appearance and that even if the pathologic changes mentioned do exist they are capable of disappearance under the influence of good drainage and ventilation unless there be caries of the bone or large polypi present. To systematically destroy the mucous lining by curettage as a regular accompaniment of the intranasal operation is to at least unduly prolong the period of recovery and the suppuration by replacing by granulation tissue the mucosa with its unrepro-

ducible epithelium. It is to be remembered that unlike the external and especially the Killian operation obliteration of the frontal sinus is not to be hoped for from the intranasal operation. Therefore I do not curette away the mucous lining, but if in spite of intranasal drainage there be continuation of the suppuration and headache, indicating advanced degeneration of the mucosa, I resort to the external operation with its advantage of thorough drainage and perfect inspection. Failure of the intranasal operation may also result from poor drainage due to more or less complete septa dividing the frontal sinus and because caries, usually affecting the sinus floor and causing lid swelling and exophthalmos, exists.

Suppurating fronto-ethmoidal cells which arch over the orbit will usually be opened for drainage by the intranasal operation at the same time with the frontal sinus.

AFTER-TREATMENT.

In the usual case if a permanent opening of good caliber be obtained, no after-treatment is needed, not even lavage. If the opening be inadequate, lavage will not remove the chronic suppuration, and will merely aggravate the suppuration which will continue as the result of the poor drainage.

Drainage, good at first, may become poor as the result of granulations, cicatricial contraction and web formation in the foremost, narrowest part of the operative field, where dependence for drainage has been placed upon cutting away the internal nasal crest with the necessary accompaniment of destruction of the mucous membrane forward. In this connection P. Watson Williams says: "It is better to have a 6 or 7-millimeter passage lined with mucosa than a wider one which can only granulate over with subsequent contraction."

It is for this reason that thorough clearance of the new channel of exit for the sinus posteriorly by removal of ethmoidal cells has been advocated in this article, because cicatricial narrowing is unlikely here.

It is to be considered that the frontal sinus can not be opened so widely intranasally in proportion to its often great size as can the maxillary antrum in the lower meatus and that, while the

artificial opening plus the natural outlet give the antrum thorough drainage, the frontal sinus has no such advantage when opened intranasally, but is in the state of an inverted bottle from which fluids flow with difficulty. For these reasons, therefore, minor secondary operations to restore or increase the caliber of outlet gained may be needed in some cases. Williams advises passing bougies into the sinus after the operation, to prevent adhesions. I have found that the attempt to prevent the formation of adhesions by separation in the healing process only creates irritation and have found it better to let them become firm scars, then removing them as widely as possible when the cut bone has healed over with cessation of granulation and swelling.

SUMMARY.

The intranasal frontal sinus operation has been developed in the last ten years principally by Ingals, Max Halle, Segura, Vacher, H. P. Mosher, P. Watson Williams and Herbert Tilley. The foregoing article is based upon their work and original observations.

The frontal sinus outlet or ostium is bounded in front by the crista nasalis interna, internally by the expanded portion of the anterior superior nasal spine of the frontal bone, externally by ethmoid cells lying between the ostium and the lachrymal bone, posteriorly by the foremost of the row of anterior ethmoidal cells. These cells are covered and completed above by the orbital process of the frontal bone and not by the cribriform plate of the ethmoid bone as is sometimes stated. Removal of the ethmoidal cells thus forming the portion of the sinus floor behind and external to the ostium gives the greatest space obtainable for drainage, creates a permanent channel into the nose and is preferable to merely cutting forward with rasp or burr to remove the internal nasal crest. The latter procedure may be needed to help create a maximal opening, but usually the crista nasalis with its important mucous membrane covering may be spared. The ethmoid cells to be removed lie between the lamina papyracea of the ethmoid bone and its turbinal plate and are roofed by the orbital process of the frontal bone which separates the operative field from the cranial cavity.

The operation usually begins with the severing of the anterior

attachment of the middle turbinate, or with resection of its anterior half. In some cases, where it stands far away from the outer nasal wall, the middle turbinate may be left quite intact. If necessary the uncinate process is next cut away with the Freer sharp septum elevators to expose the bulla ethmoidalis fully to view. With a ring curette whose edge is directed forward and obliquely upward and inward against the bottom of the bulla, the bulla is entered and the curette made to sweep away the anterior ethmoid cells from the bulla forward and upward to the ascending process of the superior maxillary bone, and if possible to the sinus floor, breaking through the latter and entering the sinus behind the cristal nasalis interna. If the sinus floor proves too hard to give way to the curette, an especially devised probe curette is passed through the sinus ostium after the way through it has been found by an ordinary probe and the probe curette is made to cut its way out of the sinus through the ethmoid cells under the orbital plate of the frontal bone, thus enlarging the ostium posteriorly so that a larger curette of the same form may be passed up into the sinus to clear away all of the cell remnants under the orbital plate and in the pathway down into the nose between the lamina papyracea of the ethmoid bone and its turbinal wall. If necessary then the ostium is also enlarged forward by cutting away the crista nasalis interna with a straight burr driven by the dental engine. The preference, however, is given to posterior enlargement because of the tendency to the formation of obstructing cicatrices in the region of the crista nasalis interna.

In cases where the suppuration continues in marked degree after the intranasal operation, although the sinus remains open for intranasal drainage, the external operation has to be resorted to. Where great swelling of the lid, exophthalmos or cerebral symptoms indicate the existence of caries of the sinus wall and progress of the disease beyond it in the form of Killian's sinuitis frontalis exulcerans the intranasal operation should not be employed.

TWO CASES OF CHRONIC PAN-SINUITIS ASSOCIATED WITH SYSTEMIC INFECTION.

BY GEO. E. SHAMBAUGH, M. D.

I venture to record the two following cases of pan-sinuitis, first, because both serve to illustrate the difficulties occasionally encountered in attempting to eradicate the infected foci and second, because both cases were associated with a serious systemic infection, which presumably took its origin from the infected sinuses.

Case 1. Miss W., age 35, consulted me first in September 1910, complaining of purulent discharge from both sides of the nose and into post nasal space. She was suffering also from disturbed digestion, which she attributed to the swallowing of the secretion from the nose, especially during sleep. She gave the following history of her nasal symptoms.

The trouble began from an infected upper molar, from which her dentist, in 1895, removed an old filling and killed the nerve because of a severe toothache. In 1897 this tooth was crowned. After this the tooth remained sensitive, and she detected a bad odor from the pus, which continued to escape about the crown.

In 1900 she began to suffer from pain over the maxillary sinus and noticed for the first time purulent discharge from the nose. In March, 1903, had the crown removed and the diseased root extracted. In April of same year, because of continued pain in upper jaw, was given chloroform and a fragment of necrosed bone removed from the upper jaw. The following June, under chloroform, an opening was made into the antrum from the canine fossa and extended through into the nose. Again in October, same year, a similar operation was undertaken, under chloroform, because of the continuance of the purulent discharge.

After these operations she continued to have a purulent discharge from the nose and suffered from symptoms of persistent head cold and more or less severe headache, but had nothing more attempted in the way of treatment until 1909, when for the first time she came under the care of a rhinologist. The previous work had been done by a general surgeon. She was again given a general anaesthesia, when the antrum was opened from the canine fossa and a satisfactory permanent opening made into the inferior meatus of the nose. Later, under local anaesthesia, the

middle turbinated bodies, both sides, were removed and the ethmoid cells drained. The patient received a great deal of relief from these later operations, especially from the headache and pain in the region of the frontal sinuses.

No further operation was attempted until she consulted me in September, 1910. An examination at that time discovered creamy pus in both nasal chambers. On the left side pus came from the sphenoid sinus as well as from the frontal sinus and some anterior ethmoid cells. On the right side pus was washed from the antrum and could be traced as coming from the frontal sinus, as well as the anterior ethmoid cells. It was also possible to trace pus coming from the right sphenoid sinus. At this time an operation was undertaken, under local anaesthesia, on the left side of the nose. The anterior wall of the sphenoid sinus was removed. The remaining anterior ethmoid cells, from which pus was exuding, were removed and the opening into the frontal sinus was enlarged by means of a frontal sinus rasp.

In February, 1911, patient returned to the city. Discharge from the left side of nose had become much less, but could still be traced to the frontal sinus and to a narrow canal extending directly backward from a point just below and to the outer side of the floor of the sphenoid sinus. Into this canal a probe could be passed a full centimeter. This infected fistula seemed to be nothing else than the Vidian Canal.

She consulted me again in May, 1911. A month previous she had suffered from an attack of articular rheumatism, which began in the ankles and involved later both knees, the hips and elbows. The joints were distinctly swollen. Under local anaesthesia an operation on the right side of the nose was undertaken. A large opening was made from the middle meatus into the antrum. A large posterior ethmoid, full of thick pus, was opened. The anterior wall of the suppurating sphenoid sinus was removed.

In October, 1911, patient was seen again. The rheumatism had entirely disappeared. She had been much relieved by the last operation. The headache, which had annoyed her, had entirely disappeared. The discharge from the nose had been greatly reduced. On the right side of the nose the only place from which pus was still exuding was the frontal sinus. On the left side pus was still coming from the frontal sinus and from the fistula described above. On irrigating the right frontal sinus the water passed through to the left side of the nose, showing a perforation in the frontal septum. The opening into the right frontal sinus was enlarged at this time by means of the frontal sinus rasp.

The condition when patient was last seen in March, 1915, was as follows: a small amount of pus coming from both frontal

sinuses and from the fistula on the left side. In spite of the removal of a large part of the inferior turbinated bodies, as well as the whole of the middle turbinates, and the exenteration of the ethmoid labyrinth, both sides, there has been no development of atrophic changes or crust formation other than that forming at the points at which pus was appearing.

Case 2. Miss M., age 42, came under my care in February, 1914, suffering from severe multiple arthritis. She gave the following history: Since childhood she had suffered more or less from nasal trouble. The symptoms were extreme liability to head colds, annoying discharge from the nose, with subsequent irritation of the throat and attacks of acute laryngitis. From 1897-99 she had a number of operations on the sinuses, one of which consisted in the opening of the left maxillary sinus through the socket of a molar tooth. In this opening she wore a tube for about a year, when she removed the tube and allowed the opening to granulate shut. At the time when the antrum was drained an intranasal operation was done to relieve a frontal sinus abscess which was causing excruciating pain in the region of the left eye. For two or three years following this operation had a probe passed from time to time into the frontal sinus.

No further operating was done on the nose until in September, 1912. During this time she continued to be annoyed by the nasal symptoms recorded above. In August, 1910, she had suffered from a severe pain in the left maxillary sinus, which lasted several days only. On January 18 of the same year she was seized with a violent attack of acute articular rheumatism. The arthritis still persists, and involves every joint in her body.

In October, 1912, work was begun on the nasal sinuses in the hope of removing the possible focus for the serious systemic infection. The ethmoid cells, left side, were broken down and adhesions were found between the remnants of the middle turbinated body and the septum, the result of some previous operation.

In December, 1913, the left maxillary sinus was opened through the middle meatus and pus washed out. Irrigation of the right antrum at this time disclosed no evidence of pus infection.

I saw the patient first in February, 1914. She was suffering greatly from the arthritis, which involved every joint in the body. She was unable to walk, every joint was swollen and painful. She experienced at times acute exacerbation of the infection, now in one joint, now in another.

The examination of the nose disclosed completely atrophied inferior turbinated bodies. The middle turbinated body, both sides, was absent. There were some crust formations here and there

in the region of the ethmoid, more marked on the right side, but no evidence of ozena. A large opening was found into the antrum on the left side. No free pus found in antrum. The antero-posterior radiogram gave no evidence of a frontal sinus either side. It was with difficulty that a small probe could be passed into the opening of a small frontal sinus on the left side. The withdrawal of the probe was followed by a drop of pus. From the right maxillary sinus a quantity of thick muco-purulent secretion was washed out. A large opening was made at this time from the middle meatus into the right antrum. The patient has since been able to irrigate both maxillary sinuses herself and both have remained practically free from secretion, except for a short period following acute head colds.

The left frontal sinus has been repeatedly irrigated and, as a rule, a small amount of granular pus washed out.

In January, 1915, by exploring carefully with a probe the locality in the right nares where crusts were seen to form, a large posterior ethmoid cell, filled with thick, creamy pus was discovered and drained. At the same time the opening of the right sphenoid sinus was discovered in the same way and the anterior wall removed. The sinus was filled with the same kind of pus. Two weeks later, by the same method of exploring with a probe the region in the front part of the nose where crusts were forming, an ethmoid cell was discovered, also filled with thick pus. I was not able to discover an opening to a frontal sinus on the right side.

In February, 1915, two small ethmoid cells on the left side were found secreting pus and were drained. The crust formation both sides of nose much improved. Present condition of patient, as far as the nose is concerned, seems to be quite satisfactory. There is no crusting in spite of the entire disappearance of the inferior and middle turbinated bodies and the exenteration of the ethmoid. The patient feels more comfortable when she irrigates the nose once each day, but washes out very little secretion and no crusts. A careful examination fails to discover any distinct evidence of pus in any of the sinuses. The general condition of the patient is not at all good. She is free from acute exacerbations of the joint infection and the associated rise in temperature, but the inflammatory changes in the joints are apparently undergoing secondary fibrous changes, which is resulting in greater and greater rigidity. These changes are producing, probably through pressure, more or less continuous pain in all the joints in the body.

Chronic infection in the nasal accessory sinuses is rarely limited to a single sinus. The process not infrequently begins as an

infection in a single sinus, as when the antrum is infected from a diseased tooth, but, as a rule, other sinuses become sooner or later involved. This is especially true of those accessory sinuses which open into the middle meatus. The infundibulum often forms a more or less closed trough, which opens at its anterior end into the frontal sinus and at its posterior end into the maxillary sinus. This trough receives drainage as well from the anterior ethmoid cells. By means of the infundibulum, pus secreted from either the frontal sinus or the anterior ethmoid cells drains directly into the maxillary sinus when the head is in the upright position. On the other hand, when reclining, pus from the antrum is conducted by the infundibulum directly into the frontal sinus. I have occasionally encountered chronic infection limited to the sphenoid sinus, but it is much more common to find combined empyema of all the accessory sinuses on one side.

The method of choice in dealing with chronic accessory sinus infection, whether the process involves one or several sinuses, is by carefully conducted intranasal operations performed under the use of a local anaesthesia. The operations conducted in this way are safer and are, as a rule, as efficient as under a general anaesthesia. The one sinus most difficult to approach by the intra-nasal route is the frontal, and here the disfiguring scar always left after an external operation prohibits this method of operation excepting for the relief of an impending intracranial complication and after all intra-nasal methods have failed to relieve the pressure and pain from the confined pus.

A REPORT OF SOME UNUSUAL CASES OF DISEASE OF THE NASAL ACCESSORY SINUSES.

BY JOHN R. WINSLOW, M. D.

It has been my fortune during the past few years to have encountered a number of cases of nasal accessory sinus disease, presenting such unusual characteristics that I have felt them to be worthy of your consideration and discussion.

CASE 1. A CASE OF CONGENITAL MEMBRANOUS OBSTRUCTION OF BOTH CHOANAE, COMPLICATED BY UNILATERAL ENDONASAL ATRESIA AND DOUBLE SUPPURATIVE SPHENO-ETHMOIDITIS. OPERATION—PRACTICAL CURE.

Miss Emma S., aged 20 years, was referred to me by Dr. Wayland Frames, with the history of being unable to breathe through or blow the right nostril; she could inadequately breathe through and inefficiently blow the left nostril. This condition was attributed by the patient to Scarlatina, occurring at the age of 10 years, but the under-development of the choanal structures, later discovered, leads me to consider it congenital. The patient was pale, thin and underdeveloped. She suffered from headache and her general health was poor. Sense of smell lost; hearing normal. Said that she had been operated upon unsuccessfully by two specialists.

Examination.—External nose small; complete atresia of the *right naris* from a point about 1 inch within the nostril to the choanae, this being due to cicatricial adhesions from the floor to the attic of the nose, with the exception of a minute canal at the floor of pin head calibre, extending to the posterior nares. Floor of nose covered with albuminoid mucus.

Left naris obstructed by a deviated Septum, and bony spur at its middle third.

Examination with the post nasal mirror showed obstruction of both post nasal orifices by a diaphragm, the right one having a small perforation at its lower septal attachment, and the left one having two perforations, one about the middle along the septum and another just above it.

Operation.—December 12, 1912, from 2:30 to 4 P. M. An injection of Schleich-Adrenalin solution was made into the cicatricial area at various points. Powered cocaine being applied along the turbinals, a probe was inserted into the pin hole fistula, followed by a probe pointed bistoury, which cut upward along the septum and choanal edge.

A dense synechia between the middle turbinal and the septum was severed with a rectangular knife, and the middle turbinal was resected with Sluder's knife and the snare. Upon removal of the middle turbinal a large gob (½ oz.) of mucopus dropped upon the floor of the naris. Removal of the turbinal exposed an opening into a large cavity, the Sphenoid, whose anterior wall was necrotic.

The ethmoid cells were exsected with Grünwald's forceps and the necrotic anterior sphenoid wall removed. Frontal sinus and antrum were not molested. The right choana was found to be underdeveloped and could not be greatly enlarged.

The naris was packed with gauze strips for three or four days, and the patient then furnished with a long splint of gutta percha for daily insertion, after syringing the nostril.

On February 13, 1913, an attempt was made—under cocaine anesthesia—to cut the two perforations of the left diaphragm into a single one, with a long probe-pointed tenotome and biting forceps; at the same time the bony spur at the middle third of the septum was removed with Hajek's chisel. Dressed with a long rubber-covered Simpson splint.

The patient was kept under observation until March 12, 1913.

At this time she breathed well through the right naris and could blow the same. There was little discharge and that mainly in the morning. Her general health was greatly improved. She could inhale through the left nostril, but had difficulty in blowing it. The post rhinoscopic picture showed a triangular opening at the lower septal side of the right choana.

By anterior rhinoscopy the movements of the pharynx could be seen through this.

On the left side was a single perforation about the middle of the membrane: the lower portion of the obstruction had not been removed.

The left side was not free, and the patient complained of sub-occipital headache upon this side. Upon probing, the anterior sphenoid wall felt carious and operation was advised.

On December 18, 1914, the patient was etherized and in the semi-recumbent position the posterior half of the left inferior turbinal was removed with scissors and snare, and the middle turbinal with Sluder's knife and Grünwald's forceps.

Turbinal remnants and the posterior synechia were removed with the largest Grünwald, under the guidance of the finger inserted into the nasopharynx.

After completion of the operation the tip of the index finger could be inserted well into the left choana. An attempt was made to further enlarge the right orifice, but the bone was too dense to be cut. The left anterior sphenoid wall was carious and easily removed with sphenoid forceps.

A long rubber covered Simpson splint was used for 12 hours and subsequently a cotton tipped applicator passed, often enough to prevent closure of the opening.

Present Condition.—Following these operations, with the assistance of tonics, the patient improved greatly in her general health and her weight—which had never exceeded 95 lbs.—increased to 110; her appetite is good.

Her nasal breathing is excellent and she can blow both nostrils satisfactorily. Headaches have disappeared. No pus is present in either nostril.

Both nostrils are open and the movements of the posterior pharyngeal wall can be seen through each side. The Sphenoid openings are large and the interior of each Sphenoid cavity can be inspected and treated.

The post rhinoscopic picture shows a moderate sized triangular opening to the septal side at the floor of the right choana, and a vertical ovoidal opening upon the left side, smaller than normal, but for all purposes adequate.

It seldom occurs to any one man to see many cases of congenital choanal obstruction; some experienced observers have never seen a single case. The complications add to the rarity and interest of this case.

CASE 2. A CASE OF MELANCHOLIC DEMENTIA DUE TO CHRONIC SPHENO-ETHMOIDITIS, CURED BY OPERATION.

Mrs. Fred S., aged 31 years, married, one child, was first seen by me on February 10th, 1897, complaining of inability to breathe through the right nostril. No discharge. Sense of smell lost. Neuralgic pain at right temple and over right eye. No asthma. Left nostril at present clear, but she has had polypi removed from both nostrils. Whenever her nose becomes stopped she suffers from mental depression. Some years ago she lost her mind temporarily and was a resident of one of our insane hospitals. Duration of condition 7 years. At present she is sane, but peculiar and eccentric, with a coarse masculine voice. At times preceding her menses she exhibits epileptiform convulsions. A polyp was removed from the right naris at this visit. Patient was not seen again until February 26th, 1908, when several polypi were removed from the right nostril, also in June of same year. On December 17, 1909, she returned complaining of severe headache, at times almost intolerable. Multiple small polypi were found in the nasal attic and a medium size polyp in the right naris. On December 21st, an anterior ethmoidectomy was done on both sides with Luc's forceps, and the nasofrontal ducts probed. Early in the operation the patient had an epileptiform convulsion and collapse, requiring the use of stimulation. The operation was completed (cocaine anesthesia) when the patient became unconscious and remained so far several hours—pulse and general condition good. She then disappeared until May, 1913, when she returned complaining of return of headache and mental depression. Multiple polypi were found in both nostrils and a diagnosis of chronic spheno-ethmoiditis was made. May 12, 1913, multiple polypi were removed from both nostrils and the ethmoid cells exenterated with Grünwald's forceps and Worthington's curets. The anterior wall of both sphenoids was removed. The patient fainted many times during the operation, under local anesthesia, and at the termination became unconscious and remained so for two hours. She was seen at intervals until November 4, 1913. At this time she had had no headaches and her mental condition was normal. No polypi were present and both sphenoids were wide open and accessible to treatment. Subsequently the patient left to take up her residence in Texas. The climate, however, did not agree with her and she returned to Baltimore and was seen by me on July 20th, 1914. At this time I removed a large polyp from the right nostril and several small anterior polypi from the left. Both sphenoid fistulae were wide open, exposing the interior of the sinuses. The patient has been

seen at irregular intervals since, and was last examined Jan. 26th, 1915. She was in splendid general and local condition; looks and feels well; her voice is much softer and more feminine. She is conscious of a change in herself and no longer feels and acts "queerly" as she formerly did. She rarely has fits of depression.

Although the influence of nasal conditions on the mental faculties was recognized by the ancients, I am convinced that cases of mental disease are at times classed as "incurable" without adequate examination of these regions.

Although an inmate of one of our best conducted institutions, as far as I can learn from a most careful inquiry, no examination of the nose by an expert was ever made or suggested in this case.

CASE 3. A CASE OF SUPPURATIVE SPHENO-ETHMOIDITIS SIMULATING OZENA, AND CAUSING MENTAL CONFUSION, IMPAIRED MEMORY, INTENSE HEADACHE AND BLURRED VISION, CURED BY OPERATION.

Miss Rita T., aged twenty-four (24) years, single, consulted me on January 17, 1912, with a discharging left ear, mastoid tip tenderness, but normal temperature. After a free myringotomy and under suction irrigation with Fowler's douche the condition cleared up in 11 days without further operation. During this attendance I learned the following history:

Patient had suffered for years from a loss of sense of smell, associated with a scabby discharge of foul odor, unless the nose was kept clean; this was told me by patient and spoken of by her friends.

She suffered also from headaches of a mixed form, at times neuralgic in type and temporal and supraorbital in location, at other times dull and suboccipital, and again a combination of the two. These headaches had no relation to the menstrual periods.

When suffering from these attacks her vision was frequently blurred, and at times she exhibited a mental confusion, so that she did not know in which direction to go. This syndrome she terms "spells." On one occasion she had manifested embarassed respiration and loss of consciousness for about an hour.

Upon examination both nostrils were found to be filled with moist scabs, the left inferior and middle turbinals were atrophic; upon aspiration, after cleansing, pus was seen exuding from the

sphenoid, whose outer wall was covered with granulations; probing caused pain similar to the suboccipital headache, to which patient was subject. No ostium sphenoidale could be found. Creamy pus was seen trickling over the head of the left middle turbinal.

On March 13, 1912, under 20 per cent. cocaine, the left middle turbinal was removed with Luc's forceps, and granulations and bone curetted from the anterior sphenoid wall.

As no ostium could be found, further operation was postponed and the nose was packed with gauze strips. The patient endured the operation well and left the operating room in good condition.

Some fifteen minutes later she began to exhibit convulsive seizures of an epileptiform character.

This seizure being typical of others which followed later, I shall describe it somewhat in detail. The patient was unconscious with pupils widely dilated. Her forearms were contracted, fists tightly clenched and legs drawn up against the abdomen. She would continually thrash her arms about from side to side, striking herself or any one within reach, unless restrained. At times the body would assume a condition of opisthotonos. The respiratory movements increased in rapidity until a condition of apnoea ensued. The patient would then hold her breath until one began to wonder whether she would ever breathe again.

A slow inspiration would then occur followed by increasingly rapid breathing and a repetition of the cycle (Cheyne-Stokes).

During this time the pulse though rapid was good. This seizure lasted about five hours: was of a most alarming nature, and the convulsions could only be controlled by etherization. At the end of the attack the patient suddenly regained consciousness.

The nature of this seizure will be discussed later on.

March 14th, the nasal packing was removed and by March 26th all wounds had healed.

Treatment of the mucous membrane with a pigment of thigenol was begun and the patient put upon Blaud's pills, fresh air and rest.

She was very nervous, with twitching muscles and on one or two occasions had fainting spells. When seen on April 29th the

nasal mucous membrane was much improved, presenting a small amount of clear mucus resembling syrup. She had had no suboccipital nor severe headache. Was very nervous and went away for a two weeks' change. After her return she was seen and treated at varying intervals until December 11th, 1912, when she reported that she had had no return of her "old headaches," her nerves were much better and she no longer had "spells."

The nose was quite clean, contained no crusts and only a small amount of mucopus in the anterior ethmoid region. The patient was furnished with a nasal syringe-douche for home use and treated at the office at increasing intervals until June 25, 1913.

At this time she stated that she had had a terrific suboccipital headache the preceding day, and on several occasions previously, sometimes in morning and sometimes in evening. By systematic probing I finally discovered the ostium sphenoidale situated high up and far around to the septal side of the anterior wall of the sphenoid. This was a very narrow opening leading into a large cavity, lying partly upon the opposite side of the septum. The bone within the sinus felt and sounded bare.

Opening up of the sphenoid was advised, but deferred by the patient.

On September 16, 1913, she returned complaining of dull headche on left side, mental depression, loss of memory and confusion in orientation. Operation was insisted upon and performed the following day under local anesthesia, duration about three-quarters of an hour.

A large sphenoid sinus was opened up and overlapping this to the outer side, a large posterior ethmoid cell containing pus.

Convalescence was prolonged and attended with severe suboccipital headaches and general weakness. On October 22nd she reported that she had had no headaches for a week and felt finely. No mental confusion since the operation. Headaches became less frequent and severe and changed their type from suboccipital to vertical.

On January 28, 1914, she reported that she had been without headache of any kind for ten days.

On that day she had a slight dull pain on the left side of the

head; this was relieved by cocaine carbolic application within the sphenoid cavity.

On March 6th she complained of a severe hemicrania on the *right* side, which was relieved by cocainization of the right and left sphenoid (Sluder's method). Four days later a milder attack was benefited in the same way.

Shortly afterward the patient was seized with pain and swelling over the appendix and was confined to the house but no operation was done. This appendicitis was probably secondary to the nasal suppuration. She has had no subsequent attack.

On May 23rd the patient reported that she had had no trouble at all for six weeks; had increased in weight and "felt better than she ever did in her life." Her looks confirmed this statement.

She reported again on July 13th with a recurrence of headache on the left side, which was found to be due to a protuberant mass of granulations which was removed from the sphenoid fistula.

On October 13th she reported that she had been having severe suboccipital headaches, mostly on the *right* side.

About one week previously she found that she could not use her left limb upon awakening, but this passed off during the day. She also told me that about one year before this she had a similar attack in the right side in a "movie parlor" and had to ride home in a taxicab. The first attack lasted for a period of 6 days, during which she was confined to bed.

At this period I had visions of a latent brain abscess. The alarming symptoms did not recur and I insisted upon operation on the right naris.

This nostril presented the following conditions:

Considerable sticky muco-purulent secretion from hyperplastic ethmoiditis, the hypertrophied middle turbinal being so tightly jammed against the septum that a fine probe could scarcely be forced between them; under cocainization the probe could be passed into the right sphenoidal ostium.

A radical spheno-ethmoid operation was done on November 3, 1914, by Mosher's method, under ether; time about 1¼ hours.

The ethmoids were somewhat sclerosed and shallow. The sphenoid was of medium size and the ostium higher up and farther to the ethmoid side than normal. This was enlarged by the usual method, and the left sphenoid fistula, which had somewhat closed, was re-opened.

Ether anesthesia was employed under the idea that the convulsive seizure of the previous operation may have been due to cocaine intoxication. Notwithstanding this, the usual epileptiform convulsions occurred, although by no means as severe nor of as long duration (about 4½ hours).

These also could only be controlled by repeated etherization. As before, the Cheyne-Stokes respiration was exhibited. Shortly after the operation a hemorrhagic effusion occurred into both eyelids of the right eye, closing the eye and causing a black eye that lasted for some weeks.

At the first dressing on November 10th, a slight tendency toward convulsive movements was noted, but no further consequences ensued, and the patient left the hospital on the following day.

From this time she has progressed favorably, gaining flesh and strength, assisted by tonics, and on January 28th, 1915, stated that "she had never felt as well in her life."

Patient returned on February 5th, 1915, complaining of a bad headache located at the posterior portion of the vertex.

There was no congestion nor swelling within the nose and drainage was unimpaired. A 1 per cent. carbolized oil instillation was made into each sphenoid cavity and the headache disappeared the same evening.

She was not seen again until February 23rd, when she reported that she had had no trouble for two weeks and never felt as well in her life; there was little nasal secretion, the sphenoid fistulae were wide open and the interior of these cavities looked dry and healthy.

Regular treatment was stopped at this time.

Six weeks later (about April 1st) patient reported that she had had no trouble until that day when she had a slight headache.

An instillation of 2 per cent. carbolized oil was made into the sphenoids and the patient has not been heard from since.

Of course I am aware that the word "cure" can not be employed in an absolute sense in a case of this kind, and that she will always have to devote attention to her nose herself and be kept under observation.

Aside from slight and occasional headaches, all serious symptoms have disappeared; her general and nervous condition is excellent; she has gained in weight, feels well and looks well.

Several interesting questions arise in connection with this case.

What was the nature of the impairment of motion of the legs, described by the patient as occurring on two distinct occasions?

In a person of her neurotic temperament, hysteria might well serve to explain this and subsequent nervous phenomena, and the short duration and spontaneous recovery without serious consequences would seem to substantiate this view. And yet I must confess that I was much alarmed when I learned of these occurrences and feared brain abscess or other grave cerebral conditions. Unfortunately I was not summoned at the time and had no opportunity of observing the attacks.

Efforts to secure a neurologic consultation did not meet with the approval of the patient's parents, as the condition was so transitory and there were no ill after effects.

What was the nature and significance of the epileptiform seizures following each operative manipulation? The first attack I was inclined to attribute to cocaine intoxication (20 per cent.) and nervous excitability; but the pulse was good; there was no cyanosis and there was no sweating nor clamminess of the skin. Moreover a similar attack occurred after ether anesthesia. Observation of the seizures with the violent movements of the arms and legs, and opisthotonos, suggested hysteria, but she was unquestionably unconscious, and would have injured herself had these movements not been controlled.

In my opinion hysteria does not account for all of these nervous phenomena, but there was some irritation of the higher centres of the brain and cord, originating in the nose and transmitted through the nasal branches of the fifth nerve.

Some suggestion of an epileptic inclination was afforded by the general tonic and clonic spasms, and loss of consciousness.

In this connection the "spells" manifested at times by the patient should be considered. These were attended with mental depression, impaired memory and mental daze, with and without headache.

Upon her visits I frequently noticed that the patient seemed in a condition of great nervous tension—manifesting spastic contraction of the arm and leg muscles and at times the face. Could these manifestations be regarded as "epileptic equivalents" originating in the nose from reflex irritation or toxic absorption, and acting in the brain?

The *headache* in this case was of a complex type and due partly to toxic absorption, partly to reflex irritation from pressure-contact and pus retention, but largely to irritation of the spheno-palatine ganglion, as proven by the result of the local treatment.

Amblyopia was a part of the syndrome which she designated as "spells"; this existed only during the attacks, and in the intervals vision was normal.

This is one of the commonest of the many ocular complications of sinus disease, especially the posterior ethmoid and sphenoid sinuses. Its cause is not well understood, by some being attributed to pressure and reflex irritation, and by others to absorption of toxins.

CASE 4. A CASE OF FRACTURE OF THE SKULL, INVOLVING THE LEFT FRONTAL SINUS, ROOF OF ORBIT AND NASAL WALL, PRODUCING A SELF-PERFORMED KILLIAN OPERATION: EXPOSURE OF THE BRAIN. SUBSEQUENT INFECTION AND EMPYEMA OF THE FRONTAL SINUS, DRAINING THROUGH THE NOSE. OPERATION—CURE.

James S., a colored man, aged 34, of rather low intelligence, was referred to me by my colleague, Dr. S. K. Merrick.

He had been admitted to the Surgical Department of the University Hospital on October 30th, 1913, with the history that in the preceding June he had run into a post while playing "catcher" in the dusk.

This was followed by neuralgic pain in head and pain in swallowing; which symptoms improved later on.

Upon entering the hospital he exhibited a swelling in the frontal region and marked edema of the eyelids of both eyes, especially the left. This had existed for about 10 days.

Temperature and leucocytosis were normal. Also eye-grounds and pupillary reaction.

A radiogram taken at this time showed large unusually clearly defined frontal sinuses, with no evidence of the conditions subsequently found.

Noticing a foul odor and profuse purulent discharge from the nostrils, the case was transferred to the Nose and Throat Department for treatment.

Examination of the nose at this time showed obstruction of both nares; the left naris being almost blocked above by a greatly deformed septum; probing discovered bare bone. Both nostrils contained moist scabs of a foul odor, and a profuse purulent discharge existed on the left side.

External frontal operation was determined upon, and performed under ether (vapor apparatus) on November 28, 1913, with the assistance of Prof. Merrick and Dr. Stem.

Owing to the great infiltration of the supraorbital tissues I incised very slowly and carefully through these, and not encountering bony resistance at the usual depth, by the use of the probe I discovered that the anterior sinus wall was missing; I also found the sinus cavity to be filled with granulations and could not detect the bony resistance of the posterior wall. Very cautiously the mass of granulations was removed and the sinus cleaned and dried; it was then seen that the greater part of its posterior wall was destroyed, and the cerebral dura exposed over an area as large as a twenty-five cent piece.

At the lower inner angle of the sinus a loose mass was detected, which with a little manipulation was extracted, this sequestrum measured about 1½ x ½ inches and upon study proved to consist of the left nasal process and a portion of the nasal bone, together with the inner portion of the lower orbital rim and floor. I also removed a loose piece of bone from the top of the nasal septum and fragments from the floor of the frontal sinus.

After cleaning up the operative field, upon careful examination I observed at the upper inner angle of the sinus a gray convoluted area, which resembled and which proved to be, anterior frontal convolutions. These were exposed over an area as large as the little finger nail, and were denuded of dura mater.

This fact was substantiated at the time of operation by a general surgeon who was present, and subsequently during the dressing, by another experienced general surgeon.

The operation was completed and the nasal wound closed, but the frontal was left wide open. Upon applying the dressings I remarked to my assistants and students that I did not expect the patient to survive 48 hours.

The following day he showed little effect from the operation, and in fact I was told that he had gotten up in the night and attempted to go to the toilet unassisted. The dressings were changed the following day and daily thereafter as long as necessary; subsequently at longer intervals, by myself or my interne Dr. Stem.

For a time there was considerable swelling and soreness of the left forehead above the sinus region, and much pus could be stripped down by pressure. On two occasions sequestra of considerable size worked their way slowly downward into the wound area and were removed.

No general symptoms of interest were manifested until December 19th, 1913, when the temperature rose to 102 deg. and cough developed, marking the onset of a broncho-pneumonia, through which he was successfully piloted by my colleague, Prof. Zueblin.

The patient remained in the hospital and was dressed at suitable intervals until June 4, 1914.

The only noteworthy occurrence during this period was exposure to a case of small pox, necessitating the quarentining of himself and the entire ward.

At the time of his dismissal the patient was going about and doing odd jobs around the hospital.

The greater part of the wound had closed, and the skin of the forehead had been turned in and had covered over the exposed brain.

There was a slight mucous or mucopurulent discharge at the lower inner angle of the fistula.

The patient dressed this himself with a piece of gauze and adhesive plaster.

He also used an alkaline nasal douche with a syringe.

Having in mind an ultimate plastic operation, which I hesitated to perform at the time, and wishing to keep this case under observation, he was retained as orderly in one of the wards of the University Hospital. He was seen from time to time and upon one examination I discovered an empyema of the left antrum and a right nasal sequestrum.

The frontal wound was in good shape and required little attention.

He was last seen early in April, 1915.

I was preparing to correct the nasal and antral conditions when for some infraction of discipline he was dismissed from his position.

This was nearly two years from the date of injury and one year and four months from the date of operation; of this time (184 days) 6 months were spent in the hospital.

I am aware that there may be some question as to the origin and nature of the conditions present in this case. Personally I am convinced that a traumatic fracture of the frontal bone and both walls of the frontal sinus, associated with fracture of the nasal process and orbit occurred. Also of the nasal septum.

Subsequently the sinus became infected from the nose, setting up an empyema, which would have resulted in serious consequences, but for the excellent drainage which was afforded by the accident.

I am led to this belief by the definite history of injury and the clean cut appearance of the sequestra removed. Also the absence of a syphilitic causation, established by a negative Wasserman, not once but on several examinations.

Another question which I would like to hear discussed is as to the proper line of conduct in a case of this kind. Granted that all sequestra had been removed and that suppuration had ceased, would it be good judgment and conduct to dissect up the

skin and attempt to correct the deformity by a plastic operation, or would it be wiser to "play safe" and let it alone?

In conclusion, I hope that these case histories have proven of sufficient interest to justify their presentation and the use of the term "unusual" employed in the title of the paper.

REFERENCES:

"Nose in Its Relation to Epilepsy." W. Sohier Bryant. Med Record, Nov., 1907.

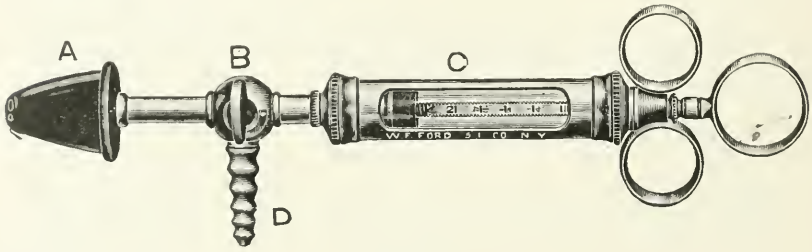
"Attenuated Types of Suppurative Sphenoidities." W. E. Casselberry. Trans. Amer. Laryngolog. Assn., 1911.

"A Study of the Anatomic Relations of the Optic Nerve to the Accessory Cavities of the Nose." H. Loeb. Annals of Otol. Rhinol. and Laryngol., 1909.

Discussion.

Dr. Harmon Smith, New York City: I have here an instrument which bears on the treatment of the condition under discussion. It employes the vacuum induced in the sinuses by the suction used for evacuating those sinuses, to inject therein medicaments such as the pathological condition underlying the sinusitis warrants. In my hands the lactic acid bacillus in suspension has proved very effective. The syringe is first loaded with the solution, either of the lactic acid bacillus, argyrol, iodine or such other medicaments as the surgeon wishes to employ.

The two-way stop-cock is then turned down towards the suction pump and a vacuum is produced in the nose and sinuses. While this vacuum is still holding, the stop-cock is turned in the direction of the syringe and nose piece, and by means of the piston the solution is forced into the nasal cavity and likewise into the sinuses. This has been definitely proven by employing colored solutions and washing out the sinuses subsequent to the injection.



(Fig. 9.)

I have found it advisable to place these syringes in the hands of the patient, and by employing suction with a bicycle pump in which the valves are reversed, some member of the patient's family can produce the required vacuum and the medicament be injected almost as effectively as when the doctor himself utilizes the instrument.

During the winter all of the acute and sub-acute cases have yielded to this treatment in a marvelously short time and even some of the chronic cases have shown marked improvement.

Dr. Thomas Hubbard, Toledo: Referring to Dr. Coffin's method, I have one criticism to offer concerning the amount of negative pressure reported to have been used. The statement that he registered twenty pounds, more or less, of negative pressure is absolutely incorrect. The mucosa will stand not more than four or five pounds. This can be determined exactly if measured by a manometer. There is more or less hemorrhage from five pounds of negative pressure. The pressure gauge used by Dr. Coffin probably records in centimeters of mercury instead of inches. Twenty centimeters would be equal to eight inches or four pounds pressure.

Dr. Henry L. Swain, New Haven, Conn.: The idea of Dr. Wilson's paper is in line with what I have always held. If the ciliated epithelium of the cells can be preserved better results will be obtained than would otherwise be possible. The less the traumatism the better.

I had the pleasure of seeing two of the cases mentioned by Dr. Coffin, and the exhibition of the method on the patients. I learned a great deal from the demonstration. I saw him treat a man into whose nose and sinuses I could easily see. The patient had lost his septum and it was possible to see into the sphenoid sinus. Everything was very open and apparently clear. I could see no secretion at all, yet Dr. Coffin got out a tube half full of secretion. It was not only serous matter, but pus as well, and was colored with iodin which had been introduced two or three days before. In the case of the woman there was some pus along the floor. This was all sucked out. This patient was taken into the dark room to note the progress of the patient. At the present time the right or diseased side of the face transilluminates better than the left. The effect of the Bulgarian bacillus will be proved by time. The applicability of the apparatus has been demonstrated.

I was called upon to treat a case of acute antrum disease in a man who had a round opening in his septum. By going in on the opposite side I could use small tubes or probes, and could

flush out the antrum through the natural opening. I could look in through healthy nostril, put the tube in, and flush out perfectly well, curing a chronic sinusitis with the greatest ease.

Dr. John F. Barnhill, Indianapolis: Two years ago I saw Dr. Mosher's specimens and his method of operating at that time, and I have employed the method since, with very good results. It is important to bear in mind the nature of the osseous box one is working in. The limitations can be well marked out, and that is what makes Dr. Mosher's method safer than some of the others. The Ballenger operation is dangerous unless the bone is soft. Where the bone has been softened by the polypoid masses, and where the cells are filled with polypi, the Ballenger method is excellent. Until the posterior retaining wall is reached the operator is within the field of safety. So, then, we are working within a bony capsule, the limitations of which, unless diseased, will give the sensation of where we are working. In the absence of these limitations the Ballenger knife is useful.

Dr. Charles W. Richardson, Washington: In the Mosher operation I have met with one complication, which I am surprised that others have not met,—the possibility of entering the antrum. There is danger of shaving off a small part of the maxilla at the junction of the orbital plate and inner wall and thus opening into the antrum unless one is very cautious in making the downward stroke.

Dr. E. Fletcher Ingals, Chicago: The Mosher operation on the ethmoids seems to me very desirable. However, leaving the middle turbinated body until the end of the operation has not appealed to me. Unless the posterior cells are involved, I prefer to take off only the anterior portion of the middle turbinate, to give a better view. In acute cases of frontal sinusitis the Mosher method is admirable for opening up the sinus.

The intranasal method of opening the frontal sinus, which I devised several years ago, has answered my purpose better than any other methods described, giving better results in chronic suppurative frontal sinusitis in ninety per cent of all cases. In acute cases I often cannot get the probe in and in such cases I favor Mosher's method. The burr that I use is six millimeters in diameter. I have had four or five cases in which I could not pass a probe in the whole distance, it apparently stopping in a fronto-ethmoid cell. In such cases I insert the probe as far as possible and then run in the burr, after which I have found it easy to introduce the probe to the upper part of the frontal sinus. The burr is then run in again and the gold drainage tube introduced. The probe upon which the burr runs prevents one

from doing any harm. If merely the frontal sinus is diseased, this method gives all the opening that is necessary and in fully ninety per cent of the cases the patients get well as rapidly as they would or even more quickly than from any of the more severe operations. Cocaine or cocaine and adrenalin anæsthesia is employed. As a rule there is no use of making a drainage canal more than six millimeters in diameter. It is unnecessary to make it a centimeter or more. When all is ready the burr can be run in, in from one to three seconds. It gives no shock. Immediately after the burr is removed, I pass into the sinus through the packet a strip of one-half inch gauze with selvage edge about one foot of the distal end of which has been saturated in a liquid formed by rubbing together equal parts of camphor and carbolic acid. This is allowed to remain only five minutes. The object of this is to disinfect the cavity and fresh wound as thoroughly as practicable. The gold tube, which is self retaining is then introduced. This tube is about three centimeters in length, and is six millimeters in diameter. One end of it is cup-shaped, and oval so that when it is placed in anteroposteriorly it does not press upon the sides of the naris. The other end consists of six flaring springs. In introducing the tube a gelatin capsule is placed over the springs to hold them together. It soon dissolves. This is of the same curve as the probe, and, therefore, will slip in with ease through the opening that has been made by the burr. I had some tubes made of an alloy but the gold ones are more satisfactory. They should be left three or four months in order that the drainage canal become lined with mucous membrane and then it can never close. In between five and ten per cent only, of cases of suppuration of the frontal sinus more radical methods are desirable. If it should be desired to make the drain larger, it may be easily done with a rasp or Halle's pyriform burrs. No harm can be done with the pyriform burr. Some have objected to this operation on the ground of danger; but I think them in error. I have examined a large number of skulls and have seen only one in which there would have been danger from this operation and I think any other method would have been even more dangerous in that instance.

Dr. Lewis a Coffin, New York City: I employ a method somewhat different from that of Dr. Mosher. Where he goes in with a curet. I enter with a chisel. One will know by a slight tap on the chisel whether he is over solid bone or not. The chisel having entered the ager nasi cell or some other neighboring cell is pushed sidewise toward the median line. This makes quite a large opening into the ethmoid tract. Through this opening is

entered one blade of Luc's forceps, the other blade being free in the nostril. By closing the forceps and making a sort of rotary motion of the same one is able to remove a considerable amount of the body of the ethmoid. Three bites and one can generally look into the sphenoid. There is very little hemorrhage. In fact, I do not remember of ever having been obliged to pack a nose following this procedure.

Dr. William E. Casselberry, Chicago: In the earlier years I employed the Hajek method but long since modified it variously, proceeding often as described by Coffin and incorporating, of late, Mosher's suggestions; excepting that whatever the method I always first remove part or most of the middle turbinated body. Surely one gets better vision when this is done. That which is left of the turbinal is sufficient as a guide, without having the anterior part in the line of light.

Since Mosher's first demonstration a couple of years ago I have removed the overhang or extension upward of the plate of the middle turbinal and furthermore its extension upward and backward more freely than formerly and thus far only to advantage and without detriment, but I do so still with some trepidation, having always in mind a statement by Watson Williams and others that the upper wall is so provided with lymphatics and blood vessels that there is a special facility for communication of sepsis to the brain. That statement has deterred me sometimes from making as complete an operation as desired to clear the frontal approach and for spacious entrance of the sphenoid. I have also, at times, found the upper turbinal plate, approaching the sphenoid, of ivory-like hardness, almost impossible to cut back flush with the sphenoid wall in order to make the classical Hajek operation.

Dr. D. Bryson Delavan, New York City: In connection with the various mistakes which are liable to be made, and which are made, in the question under discussion, I recall a case which is not absolutely in harmony with the paper, but which is suggested by it. A young married woman was sent to me for the removal of tonsils. She was suffering from rheumatoid arthritis and general depression in health. I found nothing in connection with the tonsils to warrant operation, but the internist sent her back saying he was sure that the tonsils must be the cause of the increasing rheumatic trouble. Within twenty-four hours after I saw her and advised against removal of the tonsils she had a violent attack of appendicitis. The appendix was removed, was found to be much diseased and there has been no return of the rheumatoid arthritis since, now nearly a year ago.

Dr. Wilson, closing the discussion: There is nothing I need add to the paper I have already read except to answer the question in regard to the lymphatics between the nose and the cranial cavity. Our knowledge of these lymphatics is unsatisfactory. The probability is that they run along the perilymphatic spaces on the arteries and nerves. It appears to me that there is sufficient evidence that the lymphatic current along the nerve trunks is towards the cranial cavity. It is well known that the subarachnoid space is prolonged along the olfactory nerve trunks through the cribriform plate to their distribution in the upper nasal passages. It is generally understood that the danger of infection along these subarachnoid spaces ought to be considered in all operations in the olfactory region of the nose.

Dr. Coffin, closing the discussion: Answering Dr. Hubbard's remarks about the amount of pressure: the gauge is graduated, but how I do not know. When I presented this apparatus at the Academy of Medicine in New York the question came up and it was thought that the pressure gauge was so scaled that each unit represented one pound. Each degree on the scale, however, may represent a certain column of mercury, in which case when I have spoken of using pounds I should have spoken of using so many units of pressure as represented by the pressure gauges in use.

Dr. Mosher, closing the discussion: I am sorry to have added to the nomenclature, but the term *agger nasi* seems to me to be better for the cell at the unciform curve than lachrymal or infundibular.

The selection of a method of operating upon the ethmoidal labyrinth is a personal matter. The danger of working in the extreme upper and anterior part of the middle turbinal has been mentioned by Watson Williams and also by Freer. The higher one goes the greater the danger. Two patients died from meningitis, as I said in the paper.

I do not see why the rasp is more dangerous than the burr.

For the last year I have removed the anterior end of the middle turbinal, as a routine procedure.

As to opening the antrum, as suggested by Dr. Richardson, the amount of overhang varies greatly. In extreme cases the overhang in front is great. In many cases of frontal sinuitis the antrum is already infected. One also runs the risk of infecting the antrum by taking off the unciform process, as the inner wall of the antrum is opened as soon as this is removed.

Dr. Otto T. Freer, Chicago: In 1903 Holbrook Curtis gave a description in the Laryngoscope of an intranasal operation in

which he opened the antrum widely in the inferior meatus, using the trephine and burr. I have employed this operation with modifications ever since and have had unvarying success with it in curing chronic suppuration of the antrum, having had complete recovery in some seventy cases. Most of them got well as soon as a broad opening was established in the nasal wall of the antrum. In most cases I resect the anterior half of the inferior turbinated body, but it is not always necessary to do this.

The trouble with the Ingals frontal sinus operation is the tendency of the opening made to contract, a contraction which in all cases must be warded off by prolonged wearing of Ingals' gold tube. Where the sinus is opened by clearing away the ethmoidal cells posteriorly to the sinus ostium the passage obtained usually stays open of its own accord. In the cases where it will not Ingals' tube will prove valuable. I am working at the making of a rubber drain which may be passed up into the sinus intranasally and which will stay there until drawn out.

Max Halle's new flap operation should be studied.

As I state in the paper, the rasp I regard as dangerous, as I know of one case of fatal meningitis resulting from its use. While designed to cut on the downward motion it is a rigid piece of steel which must be wedged up into a cavity of varying form and size to get an effective stroke and it must therefore certainly endanger the posterior sinus wall. The burr is a far better cutter and Max Halle's burrs, or a burr of a similar construction, are safe implements.

Dr. Geo. E. Shambaugh, Chicago: The danger of setting up a meningitis, as pointed out by Dr. Casselberry, exists especially where an improper method of operating is followed. The communication between the brain cavity and the nasal chambers is confined to the region of the cribriform plate. If the mesial plate of the ethmoid labyrinth is broken and torn away the avenue is opened through which infection may readily extend to the meninges. The ethmoid labyrinth itself has no communication with the brain cavity. In operating the region of the cribriform plate should be carefully avoided.

As to the use of the rasp: it is not intended that this should be pushed upwards with force. Just the opposite action is intended. Used properly, it is not dangerous.

The careless use of anatomical terms is to be deplored. There is really no excuse for the misuse of terms so frequently indulged in. Fortunately most anatomical terms have been definitely fixed by the anatomical committee which met in Basle, in 1895. There

is no anatomical term more often misused than "infundibulum." The term "infundibulum ethmoidalæ" is applied to the trough lying between the bulla and the unciform. The opening to this trough is the hiatus semilunaris. The anterior end of the infundibulum opens usually into the frontal sinus and the posterior end into the maxillary sinus.

The term signifying inflammation in a sinus is often improperly formed by adding the suffix "itis" to the noun sinus, whereas it should be formed by adding the suffix to the noun stem "sinu." This gives us the word sinuitis and not sinusitis.

HEADACHES DUE TO NONSUPPURATIVE INTRA-NASAL CONDITIONS.

BY GEORGE C. STOUT, M.D.

Head pains, due to suppurative conditions in the accessory nasal cavities, are of such frequent occurrence in the daily routine of the members of this Association, their signs and symptoms are so familiar, their etiology, pathology, prognosis and treatment have been so thoroughly analyzed and disseminated among our brothers in general practice, that one would scarcely be warranted in even reviewing them here, unless it were to report the success of some new form of treatment, or some operative procedure which had proved itself far superior to our present methods.

Headaches of nasal origin, in which suppurative conditions are *not* found to be present, have not occupied a prominent place in the literature, however. In recent years diagnostic methods are improving, and fewer and fewer head pains are now relegated to the "idiopathic" trash-pile, and more and more "headaches" find their way into the office of the rhinologist. In this latter group we are all finding, here and there, a case of headache in which, by an intelligent process of elimination, the usual causes have been excluded. By "usual causes" I refer to (1) anemia (neurasthenia); (2) nervous; (3) low tension; (4) high tension; (5) digestive disturbances; (6) malaria; (7) syphilis ;(8) rheumatism; (9) gout; (10) eye-strain; (11) febrile conditions. .

The increasing number of such nasal headaches, existing without any other apparent cause, and without evidence of suppuration, attracted attention to possible turbinate pressure.

While these cases form only a small percent of all cases presenting themselves in the specialist's office (probably one-tenth of 1 per cent, or less), the violence of the pain in some instances, the occasional failure to recognize the causative factor,* and the casual way in which the subject is touched upon in the current

*Most of the cases here reported filtered through the hands of one or more specialists before I saw them.

literature, suggested that a brief report of a few such cases might not be out of place at this time.

These head pains are more often due to (1) pressure in the middle turbinate region, although occasionally they may be due to (2) sharp septal irregularities causing pressure elsewhere. Those due to the former cause seem frequent enough in occurrence to be placed in a group by themselves. Moreover, in cases of headache without the presence of pus, *turbinate* pressure is more apt to be overlooked than *spur* pressure, partly because of the periodicity of the congestion in the former instance, the nose presenting a normal appearance at the time of examination, especially if an exsanguinant is used.

In order to avoid repetition the cases here reported are merely abstracted, and the general appearances are grouped in the summary.

Case 1. Miss B. gave a history of severe "facial neuralgia" of two years' standing, and practically continuous. This poor girl was a nervous wreck, declaring that she would prefer to die rather than to continue in such pain. In the course of her two years' treatment previous to coming to me, her right antrum of Highmore had been freely opened, and all the upper teeth on the right side removed. In spite of these extensive operative procedures, and much additional medical treatment, the pain persisted, and in December, 1914, she was referred to Dr. Frazier for removal of the geniculate ganglion. In spite of the fact that she had already passed through the hands of at least three specialists, certain features of the case suggested to Dr. Frazier the advisability of another examination of the nasal cavities and communicating sinuses, prior to attempting the more serious operation upon the ganglion. Examination of the nares then revealed an enlarged right middle turbinate with pressure in that region, and it was suggested that the removal of this turbinate might possibly obviate the necessity for the serious ganglion operation. The turbinate was therefore removed January 2, 1915. There was some post-operative swelling, or scabbing, accompanied by pain for several days after the operation, but since that time she has been entirely free from pain.

Case 2. Mrs. M. was referred to me January 2, 1911, with a history of having had "facial neuralgia" for years. Internal remedies had failed to give relief, and she had become a chronic invalid. The pain was usually exaggerated over the right eye, and right side of the face, and her left middle turbinate had

been removed some years before by a specialist in Virginia. Examination revealed a moderate hypertrophic rhinitis, with marked pressure in the neighborhood of the middle turbinate in the right naris anteriorly, even after cocainization. In this case the painful symptoms were relieved by the application of adrenalin, cocain and astringents, but as the "neuralgia" recurred from time to time, on October 13, 1911, I removed the anterior extremity of her right middle turbinate, since which time there has been no recurrence, and her general health is excellent (May, 1915).

Case 3. Mrs. F. complained of "facial neuralgia" on both sides, and recurrent attacks of facial and head pains so frequent and so severe as to interfere largely with her ordinary vocation. Macroscopically there was no evidence of pus, and the eye-grounds were negative. There was pressure in both middle turbinate regions. After some months' treatment I removed the anterior extremity of each middle turbinate, with the result that the pains disappeared.

Case 4. Miss H. was first referred to me in May, 1914, with a history of excruciating pains "back of the eyes," and a recommendation for removal of the tonsils. At times these pains were accompanied by marked swelling, or puffiness, under the eyes. Examination showed an hypertrophic rhinitis, with severe pressure in the middle turbinate region, especially on the left side.. There was no evidence of pus macroscopically, by the X-ray, or by transillumination. Under adrenalin, cocain and astringent applications, including the cautery to the middle turbinate edge, recurrences have been less frequent up to the present time, but it is doubtful if complete relief will be obtained without operation, which, for various reasons, has been postponed.

Case 5. Mrs. T. first came to me October 10, 1905, reporting that she had had headaches for years, with an occasional sense of fullness in the ears. She was a semi-invalid. In this case tonsillar extirpation had been advised, and she consulted me more especially in regard to the tonsils. Upon examination there was found an hypertrophic rhinitis of moderate degree, with pressure points over the middle turbinate region on both sides. I advised against the tonsillar operation, and the application of cocain, adrenalin and astringents cleared up the headaches for the time-being. With occasional treatments she avoided them for six years, but on January 5, 1912, the headaches recurred for a time, and since then there have been recurrences once or twice yearly, always relieved by the relief of the intranasal pressure. For various reasons this case has not yet been operated upon, but it undoubtedly belongs to this group of cases.

Case 6. Mrs. McC. first came to me in January, 1903, for an ear condition. I saw her only at long intervals until January 16, 1914, when she returned, complaining for the first time of "a feeling of pain in the ears and teeth and, at times, in the jaw-bone." At this visit she stated that for many years she had frequently had these pains, or neuralgias, but, having been classed as an hysteric by several good physicians, she had not mentioned the matter to me before. Examination showed pressure in both middle turbinate regions, with congestion of the Eustachian tube mouths. Opening up and aerating the nasal cavities and the Eustachian tubes, by the usual methods, gave her relief from the pain. Since that time she has been under observation periodically and these applications always relieve the neuralgic symptoms, which now recur at less frequent intervals.

Case 7. Mr. F. was referred to me May 6, 1915. He complained of having suffered in the past year from a feeling of stuffiness over the bridge of the nose, and more or less pain back of the left side of the root of the nose, and the left inner canthus of the eye. This pain was often severe when his breathing was comparatively free. There had been no discharge from the nose, no cough, no trouble with the ears, and, as a rule, he could breathe freely through the nose. The pain, which had never left him for twenty-four hours at a stretch since its onset a year ago, was at times very severe, and, of late, was affecting his general health, interfering with his work, and causing attacks of mental depression. Before the onset of the pain he had been a robust, healthy man, active and energetic. Early in the history of his complaint he had been referred to an opthalmologist who also did some nose work, and who reported the eyes normal and not accountable for the pain, stating, however (after transillumination) that there was slight opacity in the region of the left frontal sinus, and that the pain might originate in this sinus. The patient then consulted a rhinologist, who told him that he had a very good average nose, and absolutely no sinus involvement, but that the septal spur, that was found in the left naris, might account for the pain. The patient himself felt the pain to be higher up than the position of the spur, as indicated to him, and therefore consulted another rhinologist, who agreed with him that the spur could not account for the pain, but suggested autogenous vaccin, with the hope of possible relief. This was declined, the patient consulting a fourth specialist, who stated that he found nothing in the nose to account for the symptoms, but suggested an X-ray examination, which the patient declined. Meanwhile, at the hands of these various physicians and specialists the patient had received routine treat-

ment for hypertrophic rhinitis, including cauterization of the inferior turbinate on the left side, but had experienced no relief, and was "growing desperate." When I saw him a rhinoscopic examination revealed a fairly normal condition of the nasal mucous membranes, which were not markedly congested or boggy, and were of normal coloring. The septum was deflected somewhat to the left, and there was a spur, about an inch and a half long, on the apex of the deflection in the left naris, lightly touching the inferior turbinate. In spite of the deflection there was fairly good breathing room in both nares, even before exsanguination. There was no evidence of secretion, either purulent or catarrhal. The middle turbinate on the left side, while apparently normal in size and general appearance, was evidently confined in too small a space, and the patient's condition was therefore attributed to middle turbinate pressure. Antiseptic, exsanguinating, astringent treatment of the middle turbinate has relieved this patient from pain for many weeks.

Case 8. Mr. W. was referred to me May 16, 1913, with a history of having had headaches for thirteen and a half years. The pain was situated over the crown of the head, sometimes extending down over the back of the right side of the head to the neck. He had consulted three rhinologists, three neurologists, several internists, and at least two opthalmologists. He had been transilluminated and X-rayed three times, and the Wasserman test had been made. All reports were more or less negative, that is to say, the opthalmologists said that his eyes would not account for his headaches; the rhinologists said that the sepal spur on the left side might possibly account for them; and the neurologists and internists had come to the conclusion that his condition was "functional." The headaches were practically constant: he had never been free from them for twenty-four hours at a time. They were exaggerated on hot, humid days, and of milder degree on clear cold days. The rhinoscopic examination showed a septal deviation to the left and a long spur on the left side of the septum, touching the external wall of the nose, especially posteriorly. The turbinates were so nearly normal that they were dismissed from consideration at this early visit. In the absence of any other causative factor, and after some routine treatment, it was decided (later in the year 1913) to do the window operation on the septum to relieve the spur pressure. This operation was beautifully done by Dr. Fisher, but gave no relief from the pain, in fact, the patient now feels that the left side was more stuffy after the operation than it was before. He again reported to me on May 21, 1915, and at this visit I found the nose in fairly good condition, save for the rather confined

area in which the middle turbinate was situated. As a last resort I referred him to Dr. Stauffer for the removal of the pressure points of the middle turbinate on both sides.

Case 9. Dr. H. I first saw this patient about two years ago, in an exaggerated attack of "migraine," rolling on the floor in agony so violent as to suggest only brain abscess, tic douloureux, or hysteria. At this time local astringent applications, and large doses of analgesics and sedatives relieved the pain in a measure, but he gave a history of having had recurrent attacks of this kind over a period of many years. I saw him again in consultation with Dr. S. (MacCuen Smith) in February, 1915, when he was suffering from an attack similar to that of two years ago, following an attack of grippe, and which had lasted, intermittently, for three weeks. He was transilluminated and X-rayed; his stomach contents, blood and urine were examined; indeed, he passed through the hands of at least a dozen physicians who eliminated everything except the possibility of pain of nasal origin. In this case the pain was sometimes most intense back of the eyes, sometimes over the eyes, and sometimes in the teeth. Examination revealed a small, narrow middle turbinate on the right side, but it was pressed tight between the septum and the external wall of the naris. There was not much congestion, no bogginess, or other signs of chronic nasal or sinus inflammation; no pus; no X-ray or transilluminative signs of abnormality; not even the appearance of "catarrhal" turbinates; only the narrowing of the upper right naris, and the upper septum moderately bent to the right, making access to the middle turbinate on this, the painful, side, difficult. In this case operation had been delayed because of the slight departure from normal of the rhinoscopic picture, but after several sleepless nights the patient was reduced to such a state of nervous and mental depression that, failing quick relief, his life was despaired of, and it was therefore decided to remove the middle turbinate on the right side. This operation was done March 11, 1915, since which time, excepting for a little post-operative swelling and pain within forty-eight hours after operation, the symptoms have been entirely relieved.

Summary.

The above list of cases might be amplified and materially enlarged from my card histories (about 15 more cases), but repetition would only be additional evidence to prove that, while not representing a *large* percent of our work, these cases of non-

suppurative turbinate pain are sufficiently important to form a group by themselves.

To summarize conclusions: The pain varies from occasional attacks of moderate degree, to more or less frequent seizures of agonizing pain. It is most commonly referred to an area back of a triangle whose angles are the glabella, the outer canthus of the eye, and the anterior nasal spine. Departing from this area, it most frequently affects the teeth, the neighborhood of the Eustachian tubes, or ears, sometimes extending to the inion, or even down to the shoulder on the affected side. It is usually unilateral, but not infrequently bilateral, or occurs impartially on either side, over the eyes or temples, now on one side and again on the other. In some women the presence of the menstrual period seems to aggravate the pain; in others it has no influence. Turbinate pain is not increased by the use of the eyes, and tenderness upon pressure at the angle of the orbit is seldom found, although sharp, shooting pains through the eyes occur at times in these cases. Indeed, the pain is often more severe in the morning, before circulation is thoroughly aroused, wherein it differs from the pain of ocular origin, which is worse later in the day, after using the eyes.

Anterior rhinoscopy shows varying conditions in different cases. The lower portion of the nose may present the delicate pink membranes approaching normal. Septal deviations, if we include irregularities, spurs, nodules or lateral thickening, or split septum, are present in, say, 90% of *all* cases that come under our observation, so they cannot be said to be peculiar to the cases under discussion. Swollen middle turbinates are frequently present without severe head pains. On the other hand, in several of the above mentioned cases the general appearance of the nares was far better than that of the average nasal case that consults us for other reasons, and in the majority of the nasal cases that I report the actual nasal symptoms were nil, and the rhinologist was sought as a last resort only because the opthalmogolist, the internist, the neurologist, and the gynecologist had each eliminated his branch as a causative factor.

The lower regions of the nares, then, often appeared nearly normal, both as to coloring and shape. In several cases a marked

septal deflection existed, and the removal of the septum had been advised—an operation that would have been needlessly severe, and which would probably have been quite ineffectual, as developed in one of my cases (Williams).

The anterior end of the middle turbinate may be red and boggy, but more often it is normal. In the above cited cases the turbinate was most frequently nearly normal in size, but its cavity was narrow and compressed either by the lesser upper (or counter) deviation of the septum on the opposite side from the readily distinguishable lower deviation, or by a bilateral thickening of the upper portion of the septum, or by a split septum (after injury).

Emphasize:

1. Slight departure from the normal, rhinoscopically.
2. Importance of eliminating all other causes.
3. Routine examination of middle turbinate fossae in all unclassified headaches or even in tic douloureux.
4. The number of unrecognized cases that has filtered through most skillful hands is my warrant for this report.

In examining these cases care should be taken to exsanguinate the inferior turbinates and their immediate surroundings *only*, so that the point of contact may be noted. In some instances the relief of the existing headache, following exsanguination, proves the chief localizing factor of the cause thereof, illustrating the point that, without the symptoms of headache for an incentive, the causative factor in the middle turbinate region might be entirely overlooked. These cases probably often follow a catarrhal ethmoiditis. The sense of stuffiness, or fullness, over the bridge of the nose was absent in many of the cases here reported, the pain being the prominent, and often the only, symptom, the patient claiming to be absolutely healthy in every other respect.

There is no evidence of pus in these cases, either microscopically or by transillumination and the x-rays. However when there is pressure in the middle turbinate region (especially when this pressure is not relieved by exsanguinating remedies) and if the pain recurs frequently and violently, extirpation of a part,

or the whole, of the middle turbinate is indicated. It is unfortunately true that, in the more severe cases the offending turbinate is situated so high up in the narrow and tortuous naris as to make the operation more difficult and trying.

HYPERPLASTIC SPHENOIDITIS: AND ITS CLINICAL RELATIONS TO THE SECOND, THIRD, FOURTH, FIFTH, SIXTH AND VIDIAN NERVES AND NASAL GANGLION.

BY GREENFIELD SLUDER, M. D.

The concern of this text is the body of the sphenoid and the cell or cells it contains; together with a consideration of its immediately adjacent nerve structures, under the pathological condition of hyperplastic bone changes in these parts. It is usually hollowed by the sphenoidal sinus. Occasionally, however, that cell is rudimentary and occupies a position in the lowermost anterior inner portion, the remaining part being hollowed by a post-ethmoidal cell; or the space may be more evenly divided between them. Clinically it is usually impossible to separate the respective technical anatomical parts prior to surgical intervention, and often not even then.

Hyperplastic disease in the nose according to my observation involves not only the bone but the soft parts covering it in the nose and in the paranasal cells, as shown often at the time of operation by polyps within the cells. Whether such changes ever occur on the orbital side of the ethmoid or maximillary antrum or the dural side of the sinuses is a question I have not as yet been able to solve. A case reported by W. B. Chamberlin[17] indicates that polyps may form in the cranium.

The morbid condition of hyperplastic bone change in the anterior ethmoidal district has been considered by a large number of writers. None, however, have recorded observations of this process in the sphenoidal-postethmoidal district. And no mention has been made by anyone of any (possible) special or far-reaching effects of such a process in the posterior district.

In some observations on the sphenoid published recently[1] I described some sphenoidal cases and stated that many, in their clinical behavior corresponded with hyperplastic ethmoiditis. They were *clinically* hyperplastic sphenoiditis. Since then, I

have assembled sections of bone removed from 185 such cases in my own practice; and I have been assisted by Dr. Jonathan Wright's examinations and conclusions regarding the microscopic changes in them.

The clinical diagnosis of hyperplastic sphenoiditis is confirmed by Dr. Wright from the examination of the anterior and inferior sphenoidal walls removed from these cases. Furthermore, Dr. Wright's conclusions passed upon the bone sections from these cases, whose histories were unknown to him, corresponded so closely with their history before and after operation as to be very striking. The list comprises those operated for suppuration of longer or shorter standing without other symptoms, which I feel should be classed as the simplest cases; and others operated for pus with more or less headache and of longer (6 months) or shorter (2 months) standing which were mild cases; and others for acute exacerbation with suppuration and acute optic nerve involvement (some totally blind) with little or no disc changes; some with transitory amblyopia; some with choroiditis simple, and others of this class with ocular palsies also, 3rd, 4th, and 6th nerves, which are of the type of ophthalmoplegic "megrim"; others of many months or years standing without pus, with slight disc swelling slowly increasing with a narrowing visual field; some with choroidal hemorrhages and total clouding of the uveal media; some serous iritis and cyclitis and anterior chamber hemorrhages, others without pus but with sensory (5th) trunk involvements (hypaesthesia) and recurrent headache of the type (severe) vulgar migrain, without and with pallor (sympathetic migrain), and one recurrent headache with loss of consciousness of 10 years' standing of the type of epileptic migrain; and six with ophthalmic migrain, complete pictures of all grades; one with great headache and hallucinations, the type of psychical migrain, and one major epilepsy. Most were uncomplicated by systemic conditions. Some, however, occurred in the course of nephritis and a number in arteriosclerosis and heightened blood-pressure, and some with arthritis deformans; some with severe digestive disorders and some in syphilitics. All systemic conditions seemed to have so little influence on the local conditions as to be unrecognizable. The length of time over

which these cases have been observed varies from 17 years to 3 months.

Intrasphenoidal observation[2] with Holmes' nasopharyngoscope after the anterior wall was removed has shown thickening of the membrane, and sometimes a marked sclerotic state, and often localized inflammation, and sometimes polyps or cysts within the sinus, and sometimes vessels entering and leaving the sinuses through that part of the wall which makes up the optic canal. Furthermore, the configuration of the sinus can often be made out accurately, especially the most important parts. These are more or less at a right angle to the shaft of the instrument, which is the direction in which the prism looks, e. g., the regions of the optic canal, foramen rotundum and Vidian canal. As the instrument is now constructed it has the defect that it cannot look forward or backward more than its 60° visual angle (30° to each side of the perpendicular) and requires a cell 12 mm., front to back, to contain its light and prism, as Dr. Gundlach has stated. It has, however, been of much help in the understanding of these cases as well as determining the comprehensiveness of the Hajek[22] postethmoidal sphenoidal operation. By these means I have been able to confirm the diagnosis of hyperplastic sphenoiditis by intrasphenoidal observation and to learn that the process is *not always universal*, and that the exacerbations which may take place in this district from coryzas *may be localized;* and that according to their *positions* they may be more or less *pernicious* or *disastrous, e. g.,* when localized about the *optic canal* they may impair vision *without other symptoms;* or when localized on the *lower latter aspect* of the sinus they may cause *maxillary* neuralgia; or on the *floor* they may give rise to *Vidian* neuralgia of any grade. I use the term "Vidian neuralgia" to express pain in the ear, mastoid, occiput, neck, shoulder-blade, shoulder, arm, forearm and hand because I found in experiments upon the nasal ganglion [18] that it could be produced by the faradic current attached to the needle when in situ for injection of the ganglion and that it could be produced separate from the anterior or maxillary part of the symptom-complex (pain in the teeth, eye and temple) by inserting the needle into the Vidian on the internal side of the ganglion. (These details of experi-

ment were not mentioned in that text.) The depressing peculiarity of this pain has been emphasized by M. A. Bliss.[19] Alcohol experiments are cited in reference 1.

In considering hyperplastic sphenoiditis as a pathological process with the part it plays clinically, I feel that, primarily, attention should be called to the anatomy of these parts.

Not long since, I showed[1] that in certain skulls the 3rd, 4th, whole 5th, 6th, and Vidian nerves were in the most intimate association with the sphenoidal cell, being separated by merely an eggshell thickness of bone, and I stated (for the first time) that the *size of the cavernous sinus,* rather than that of the sphenoid cell was what determined most of those relations, i. e., that a short or narrow cavernous sinus permitted the nerve trunks to lie upon the sphenoid body; and that usually the sphenoid cell occupied the entire body. The nerves in the canals—the optic, maxillary, mandibular and Vidian—are exempt from such control. The relations of the optic canal with the contained optic nerve, to that cell are at once important and striking and have been remarked upon by many observers, notably Emil Berger[3]; and latterly emphasized by A. Onodi,[4] and again by H. W. Loeb,[5] who has furnished us with the best presentation I have seen of that district and its variations.

Attention to the *anatomical* relations of the sphenoid cell to the foramen rotundum containing the maxillary nerve, and the foramen ovale containing the mandibular nerve, and Vidian canal containing the Vidian nerve, as well as the *clinical* importance of these relations was directed for the first time in my above cited text.[1] Those anatomical observations were confirmed by Ladislaus Onodi,[6] working by a different method. Our results were published May 11, 1912, and July 10, 1912, respectively, except for the Vidian nerve which he did not at that time consider. Later he confirmed the Vidian relations.[13] Dr. Onodi in this latter text[13] refers to my observations numbered in these references 1 and 14. He has, however, made mistakes possibly explicable by differences of language, which require correction, i. e., text No. 1 was not a "lecture" but was presented as an official communication to the American Laryngological Association at its Thirty-fourth Annual

Meeting, held in Atlantic City, N. J., May 9-11, 1912. The presentation was accompanied by the drawings which were published with the text as well as the specimens from which the drawings were made, no mention of which has hitherto seemed to serve a purpose. In his citation of the second text (No. 14) he has made a mistake as to whose researches are recorded in that text. The determination of the age at which the sphenoidal sinus reaches close relations to the foramen rotundum with the maxillary, and Vidian canal with the Vidian nerve was made by me, and not by Dr. Davis. Through personal favor Warren B. Davis allowed me to examine his matchless collection of Caucasian specimens with the understanding that I might enjoy the privilege of recording my observations giving him credit for the material. At that time Mr. Davis was not interested in the foramina and canals or nerve trunk relations to the body of the sphenoid. His desire was to contribute to anatomy a full and accurate knowledge of the "Development and Anatomy of the Nasal Accessory Sinuses in Man" (to quote the title of his monograph, 1914), and he did this with a completeness and an accuracy that surpassed all description or portrayal extant And so it was that he had definitely determined the beginning and the manner of the development of the sphenoidal sinus, but he was not concerned with its approach to the foramen rotundum or the Vidian canal, nor did he realize any clinical significance or importance in those relations. I attempted to make this clear in my text. In addition to differences in the languages (which make mistakes very easy) these points might have been brought forth with greater emphasis, which did not, however, seem to me, at the time to be necessary.

The statement is made in Dr. Onodi's text[13] that his observations were first published in "Orvosi Hetilap," March 24, 1912. Perusal of that journal, however, shows his text to have been published November 3, 1912.

Dr. Onodi and I made some similar observations. Mine were made as a necessary chapter—the applied anatomy—in a very difficult and complex clinical problem. The question of the adjacent foramina and canals was at that time a matter of importance and record for me and has grown constantly more

important. I do not, however, regard the nerve contacts with decreasing importance. Dr. Onodi's method was to follow the nerve trunks in their courses and when found in contact with the bone to measure the lengths of such contacts and note the thickness of the bone separating the trunks from the sphenoid sinus, and I believe this to be very valuable contribution to our knowledge of this district. He did not consider the foramina or canals or the part played by the cavernous sinus in determing the contacts. I, too, had tried that method, but in my hands it was less satisfactory than the method by serial cross section of this district using material carefully hardened in formaldehyde and decalcified in dilute HCl. Such material may be sectioned with a good knife, as thin as 1.5 mm., or even 1 mm. when desired. These sections when examined with magnifying glasses were most satisfactory. The macerated bones, too, in some instances were advantageous. The cross sections have the advantage that they determine all contacts most accurately as well as the relations of the foramina and canals and the thickness of the separating bone. They also give an estimate of the amount of fat or connective tissue surrounding the nerves in the foramina and canals.

In my text,[1] hyperplastic sphenoiditis was referred to as being in my opinion the lesion underlying many of the recurrent headaches, in healthy people, which bear the name "migrain." I spoke of this class of cases again[14] at the meeting of this Association in 1913 and again at our last meeting,[15] explaining some of their features. Its (hyperplastic sphenoiditis) very great importance in the life of the patient and its far-reaching pernicious possibilities were not, however, so clearly impressed upon me then (1912) as now. At that time I thought that many of the cases, if not all, were explained by the *inflammatory process* either extending *through* or *transmitting* its *toxins through* the thin bone walls to the adjacent nerve trunks because I had *proven* that *cocaine* readily *passed through* from the *sphenoid sinus* to the *nerve trunks*.[1] But within the past two years, as a result of a much wider clinical experience, I have come to feel that there are probably several factors contributing to the clinical picture, these being two of them, and that a third and probably much more

serious one is the bone change in the hyperplastic process with or without periostitis. The bone change, however, required the proof which Dr. Wright has supplied. It would seem that such material ought to be obtainable post-mortem, but so far that has not been my experience. My ideas therefore have of necessity been formed by the association of some facts with an inductive philosophy. In this connection it might be argued that the condition of the anterior wall of the sphenoid cell (which must include its post-ethmoidal face) is not a criterion for the remaining part of the body, and that conclusions drawn from that material dare not be generalized for that district. Holmes' nasopharyngoscope[2] is an aid which permits of much conclusive observation. By it we find that the hyperplastic process is *not* always uniformly distributed within the cell. It may be distributed irregularly but is usually more marked in the lower half of the cell.

Hyperplastic anterior ethmoiditis, may sometimes precede a like change in the post-ethmoidal sphenoidal district; and it was from such cases that I began to form the ideas embodied in this text. I have observed some of them for seventeen years. The first clinical effect in such a case is the closure of the frontal sinus, the outlet of which, aside from being in the district where the process so readily begins because of the direct blast of inspired air with its dust and bacteria, lends itself easily to clinical manifestations because of its being narrow usually at some point if not in much of its length; and therefore easily closed. This fact gives rise to the (non-suppurative) cases which Ewing and I described in 1900.[7] A part of the air within the cell is then absorbed resulting in a negative pressure and headache* accompanied by Ewing's sign[8] (a tender point at the upper inner front of the orbit) and asthenopia. The closure may also be brought about by other causes, irrelevant to the argument here, a detailed enumeration of which with differential diagnosis may be found in another text published recently.[9] The pathological state bearing upon the questions here in hand, is that, where the tissues of

*I have since found that the idea of a simple closure of the frontal sinus from a swollen membrane at the time of a coryza without suppuration, as the cause of frontal pain, was advanced by P. McBride,[20] of Edinburgh, in 1891 with the explanation that part of the air in the sinus is absorbed.

the middle meatus become hyperplastic. In these cases the membrane readily becomes edematous, and coryzas make polyps, which in the early history of the case disappear with the subsidence of the acute conditions; later as the bone becomes more hyperplastic the polyps remain, permanent. It has been my habit to remove the middle turbinate in such cases by an incision placed about 2 mm. below the cribriform plate.[10] This gives, in usual skulls, a funnel-shaped outlet to the frontal sinus, apex down, made by the uncinate process in front and the ethmoid bulla behind and below, the lower part being the hiatus semilunaris, measuring normally 1-2 mm., expanding to 5 mm. above, anteroposteriorly, and 2-4 mm. laterally. (It would be from the purpose to discuss anatomical variations here.) The immediate result of such surgery is a wide opening of the frontal sinus into the nose and a cessation of all symptoms for five years (approximately). The patient then returns for treatment at the time of a coryza, because of slight headache and asthenopia, which he is anxious about from previous experience. The rhinologist finds the outlet of the frontal closed, but as the swollen membrane shrinks he finds that the symptoms subside and that the outlet is then open, but smaller than it was. As the years pass he finds that the uncinate thickens a little, but that the bulla enlarges more and the outlet of the frontal becomes smaller and finally closes again and the original headache, etc., syndrome is re-established without pus. The tissues from such cases were examined by Dr. Wright[9] and found to show the changes of hyperplastic ethmoiditis. The picture in the nose shows the macroscopic changes to correspond, and to be extending backward; and later (without pus) the pain of maxillary and Vidian nerve involvement—that is, pain around the eye and in the upper jaw and temple; with pain in the occiput and neck, etc., is added as the process in the bone extends backward; and polyps begin to form above the middle turbinate line at the time of a coryza. At first they disappear with recovery from the coryza; later they become permanent. In the progress (development) of the bone disorder backward the maxillary and Vidian headaches appear only at the time of a coryza. Later, however, they recur at longer or shorter intervals in more or less severity *without visible local*

changes and continue to do so *indefinitely* with the neurologist's diagnosis *"migrain."* (I have seen such headaches of 40 years' standing very greatly relieved by the sphenoidal operation.) The same clinical picture is produced by irritation of the sphenopalatine (or nasal) ganglion, but may be differentiated by the fact that the nasal ganglion pain can be stopped by cocainization of the ganglion, whereas the pain made by the sphenoid in the nerve trunks, central to this, cannot be stopped that way.[11]

Optic nerve disorders arise *often,* secondary to hyperplastic bone change of the spheno-postethmoidal district. A large per cent. are preceded by these headaches—often for *many years.* In some cases there is a slow encroachment upon the optic nerve, as shown by slight swelling of the margin of the disc, which increases slowly with gradually failing vision. This may be a process of years. Adamkowitz[12] found that slow compression of nerves destroys function slowly. In other cases the eye becomes quickly blind wth or without changes in the disc. Some cases have a transitory amblyopia. Some show muscle imbalance, probably because of a discomfort arising from the attachment to inflamed bone at the apex of the orbit. Some show hyperaesthesia and hypalgesia over the maxillary distribution.

The *explanation* of the headaches and optic nerve disorders in such cases, I believe, is hyperplastic bone process and that its mode of operation is to narrow the bone canals through which the respective nerves pass, i. e., the optic canal with the optic nerve, the foramen rotundum transmitting the maxillary, the Vidian canal with the Vidian nerve. The foramen ovale with the mandibular nerve only rarely comes into these considerations because it is usually far enough removed from the sphenoid cell to be exempt as a clinical factor. (It does, however, sometimes become a part of these pictures.) This seems to me a reasonable deduction from Dr. Wright's findings in the wall of the sphenoid in conjunction with intrasphenoidal (pharyngoscope) observation, together with the easily seen behavior of the process on the lateral wall anteriorly, where the frontal outlet may be seen narrowing from year to year. It may here be urged that the intranasal observation was made in a part *exposed* to the atmospheric air and that the foramina and canals mentioned are not so

exposed; and that the frontal outlet being empty offers no resistance to encroachment whereas the foramina and canals are snugly filled and would offer some, if not considerable resistance; and that the osteoblasts are active only on convexities. I have, however, seen the uncinate process become markedly thickened and enlarge in its *concavity* in the progress of hyperplastic anterior ethmoiditis. And it may be urged that the lesion in the foramina and canals is probably a periostitis, which is, judging from the removed bone, probably true in some cases, but not all, by any means; whereas the hyperplastic bone change was constant for this class of cases and extended through the depths of the tissues. In other words, it was not limited to the part exposed to the air and was irregularly accompanied by periostitis. Dr. Wright and I believe that the process begins as a surface tissue change, and proceeds to the periosteal layers and bone. But the slides show that the surface and periosteum may recover and the deeper changes go on.

Very slight pressure *long continued* on a sensory nerve trunk is perceived as great pain as may be seen with the supraorbital nerve in the supraorbital notch.

The canals in children's skulls have seemed to me larger than in adults. This may explain why these headaches and optic nerve troubles do not begin more often in childhood. I have, however, seen the headaches at the age of 7 years and the eye trouble at 12 years. It is easily conceivable that a small space around each nerve is left more or less filled with fat or loose connective tissue. This tissue would be easily compressible in the foramina and canals and might allow for or accommodate a congestion rising from whatever of many causes, e. g., a digestive or other systemic toxemia or the mechanical gravity congestion produced by making the head the lowermost instead of the uppermost part of the body (in other words, when the head is turned downward in any considerable degree). If the narrowing of the canal or foramen is merely enough to take up this small space, it will, it seems to me, place that nerve in a vulnerable position, which explains some of the phenomena of these cases, namely, pain established instantly by bending the head down or by coughing or sneezing in which the peripheral blood-pressure is

suddenly raised, and sudden transitory amblyopia. Further encroachment on their calibre would explain the slow progressive optic nerve cases and the more protracted severe headaches.

If now it be conceded that hyperplastic bone process can and does narrow the bony foramina and canals adjacent to the sphenoid sinus, and that the narrowing is the cause of pain in all the contained nerves except the optic; and that the optic also suffers according to the degree and rapidity of the pathological process—we have also the explanation of why maxillary and Vidian pains are so very much the most frequent symptoms, because the lower part of the sphenoid sinus where the canals run which transmit those nerves is most often affected, and the factor of secretions and their toxicity plays here in addition to what may be the process in the bone. Next in order of frequency is affection of the optic nerve. That this, however, is less frequent than the maxillary and Vidian lesions is probably likewise a matter of drainage, it being higher and forward in the sinus. The wall of the optic canal cannot as a rule be submerged in secretion in any position in which the head may be placed unless the osteum sphenoidale be closed. In the erect posture the sinus will overflow ere this is reached. The only positions of the usual skull making the optic canal dependent is face downward, and that again would fail because the osteum would be place below and drain the cavity, or possibly lying on that side of the head, i. e., left side for left optic canal, with considerable secretion contained in the sinus. Loeb[5] has shown that the osteum is usually midway between the roof and floor of the sinus.

The optic canal would seem to be almost of necessity a later involvement, by bone extension; or localized inflammatory areas from a coryza.

In contradistinction to the clinical lesions of these nerves in bony confines, are such lesions of the nerves in the soft (loose) confines of the sphenoidal fissure, i. e., the occulomotor, trochlear, ophthalmic, and abducent, although these nerves are in contact with the bone for a longer or shorter distance as they pass through the sphenoidal fissure into the orbit. The bone here may be hollowed (often) by sphenoid sinus extending into the great wing or even by the frontal extending backward into the

lesser (Patel) wing (rare) or by sphenoidal or ethmoidal cells projected into that district. In my experience a supraorbital nerve pain of sphenoidal origin is *very* rare. Ophthalmic nerve contact with a thin walled sinus, however, is not at all rare. Pain in the brow is frequent and may arise from a number of causes, e. g., frontal sinus vacuum[7] or empyema, or maxillary nerve irritation in the sphenoid,[1] and these must be *very carefully* differentiated. Supraorbital neuralgia, however, of systemic toxic origin is *very* frequent. A lesion of the trochlearis is also very rare, according to my experience and that of my ophthalmological associates. Sphenoidal lesions of the occulmotor and abducens are seen oftener because of their arrangement in the sphenoidal fissure (the *6th* and 3rd come into relation with the wall of the sinus as soon as it is prolonged into the great wing, the 4th is more protected). These lesions are seen, however, much less often than those of the optic and infinitely less often than the maxillary and Vidian lesions. It is a fact that the nerves in soft confines are not as often exposed to the sphenoid sinus as those in the bone confines. But this, to my mind, explains only a small part of the great statistical differences, i. e., the *very* frequent involvement of those in the bone confines and the very infrequent involvement of those in the soft confines. And in this connection I emphasize again that narrowing of their confines is the probable prominent part of the lesion. Were the simple inflammatory process in the membranous lining of the sinus responsible for the clinical pictures by transmission of its toxins through the bone, or were a periostitis of the lining of the foramina and the sphenoidal fissure or were the lesion a neuritis from continuity, to blame, then in all reasonable probability would the occulomotor, trochlear, ophthalmic and abducent take part in these pictures more often. I believe this because of my cocain experiments (see above[1]). In some skulls the entire trigeminus may, by painting the sphenoid sinus with cocain solution, be paralyzed, with great confusion in the eye which the patient cannot describe. The sphenoidal sinus enlarges till it comes in close relation with foramen rotundum often as early as the 3rd year of life and by the 7th year often reaches to the Vidian canal.[14] This seems to me to be the anatomical explanation of these cases in childhood.

They are, however, rarer in childhood, as may be expected if we accept the theory of narrowing of the canals.

Dr. Wright believes that some of the pain in these cases must be made by a periostitis just as such a lesion on the shaft of the tibia causes pain.

Post-ethmoidal sphenoidal inflammation in the young may take on the hyperplastic bone process evidenced by thickening, polyps and general edema. In children it is *often* the cause of *frequent coryza* with *paroxysmal sneezing, asthma, "bronchitis"* and *fever*. I believe these symptoms are brought about as a sympathetic manifestation from the nasal ganglion.[16]

An index to the hyperplastic process seems to exist. The degree of hyperplasia of the plica septi seems to indicate a corresponding degree in the sphenoid, whereas the degree of hyperplasia of the posterior end of the middle turbinate indicates a corresponding degree in the posterior ethmoid, explicable probably by virtue of the fact that secretion from sphenoid descends over the plica[15] (usually) whereas that from the post-ethmoid passes over the end of the turbinate. The middle turbinate in *general* is *not* however an index of the changes in the *post-ethmoidal sphenoidal* sinuses.

Hyperplastic sphenoiditis, in my opinion, is the explanation of why the treatment of nasal ganglion neuralgia is so often disappointing. The diagnosis may seem clear inasmuch as the pain complex may be controllable from the nasal ganglion by cocain, but injection of the ganglion is followed by only short time relief. The injection of the ganglion helps, but the satisfactory relief of the case is accomplished only after the hyperplastic bone process has been controlled. This happens *sometimes* as a result of the injection but at other times reinjection and the Hajek operation with after treatment[1] are required. Until this is accomplished, the hyperplastic bone process may keep up the ganglion irritation.

The best post-operative anatomical results—I mean by this, that the result has remained better, for a longer time, *i. e.,* remained less altered by a continuance of the hyperplastic process, according to my observation—have been in patients whose general bony skulls have changed least from year to year. These patients show age by change in the skin rather than change of feature.

In *all* of *these cases a slight acute process added to the existant hyperplastic process brings on disaster out of proportion to the acute process.*

I append the observations of Dr. Wright made upon the conclusion of the examination of the series of specimens:

"As a result of the observations made upon Doctor Sluder's specimens and as the result of the conference with him in which he has detailed the history of each case in connection with the pathological findings, one may say in a general way that the coincidence of inflammations of the middle turbinate with inflammations of the sphenoidal sinus, is by no means universal, that is, in some of the cases marked involvement of the mucous membrane and of the bony structures in and around the sphenoidal sinus was observed while the middle turbinate was in a fairly normal condition, and the same is true in a reverse sense.

"I have been especially struck in examing the cases to observe that the vast majority of the specimens submitted to me were from female patients. Doctor Sluder perhaps can go more carefully into the relative proportion of these, but so far as the slides which he has submitted to me go, it is quite evident that perhaps three-quarters of them are from females.

"As to the histological findings, again it may be said that evidently the inflammation of the upper sinuses of the nose is a very frequent occurrence with many of the symptoms of pain in and about the nose or even of diffuse headaches apparently due to a periostitis with a local cause. Apparently, profound changes may occur in these cases in the mucous membrane and in the bone without serious involvement of the important structures with which Doctor Sluder has so long been busy, but when inflammatory exudates occur in such a way that the Vidian nerve and the 2nd divisions of the fifth are affected by the pressure of inflammatory exudates, we get periphery manifestations of pain in the lower part of the head and the cervical region running down to the shoulder which is very distressing and obstinate and may last for many years. Apparently, the same principle may be applied to the optic nerve.

"The patient may have had inflammatory conditions of his sphenoidal sinus for many years before serious involvement of

the optic nerve occurs. When it does, the evidence goes to show that the inflammatory process has extended to the neighborhood of the course of the optic nerve from the upper and outer wall of the sphenoidal sinus inducing marked functional disturbance in the eye or even complete destruction of the function of the optic nerve."

Dr. Wright's observation that most of the patients were females is true for the series presented. In practice, however, I think the preponderance of females over males is much smaller, if indeed they be not almost equally divided. In an epidemic of post-nasal infections such as has existed in St. Louis for the last three years (and I understand has existed in other parts of the United States also) the sexes seem to me to be about equally attacked. The females seem to become chronic sufferers somewhat oftener than the males, possibly because their bones are often lighter, which means that the above considered nerve trunks have less protection.

CASE REPORTS.

I append histories of some cases, each an illustration of some feature mentioned in the text.

Case 1. Miss DeH., aged 20 years, referred by father, Dr. DeH. For three years a profuse suppuration of sphenoid sinuses. Never any headache or other symptoms. Hajek post-ethmoidal sphenoidal operation. Dr. Wright reported "Membrane not markedly altered. No involvement of periosteum or bone."

Case 2. Mrs. M. D. A., referred by Dr. H. G. Mudd; aged 48, June 11, 1910 For twenty-four years had suffered violent recurrent headache of right side in maxilla, temple, ear, mastoid, occiput and neck. The attacks began after typhoid. They came on irregularly and lasted irregularly, sometimes in great violence for a number of days. They had been diagnosticated vulgar migrain by the best clinicians in many cities. The nose was usually negative in appearance. Rarely the right olfactory fissure showed inflammation. The tissues therein were thickened. Very rarely sphenoidal secretion appeared. Hajek operation Feb. 20, 1912. Dr. Wright reports of middle turbinate, great fibrous hyperplasia and also same of bone. Of the sphenoidal wall—new production of low type fibrous connective tissue and bone.

Since the operation, slight headaches have recurred at very much longer intervals. A coryza makes headache.

Case 3. Mrs. P., aged 55. Diagnosis, sphenoidal empyema. Pain in occiput, left, 6 months. Relieved by operation. Referred by Dr. A. E. Ewing. Dr. Wright's report: Sphenoidal tissue—bone shows some hyperplasia and there are marked inflammatory products in the soft parts. Middle turbinate shows marked inflammation of mucous membrane in its deeper layers and considerable hyperplasia of the periosteum along the bone areas; the bone itself is perhaps slightly thickened and the area of its distribution is considerable. In some places the bone seems to be very much thickened and the veins which it contains are gorged with blood.

Case 4. Mrs. J. D., 38 years of age, referred by Dr. W. E. Shahan, June 21, 1914. Diagnosis: Hyperlastic sphenoiditis with acute suppuration. Dr. J. Shahan's report: June 12th last was seized with violent headache left side, which lasted five days when it began to subside and the vision of left eye began to fail. Now counts fingers at one foot. Lower and central field absent. Disc appears slightly swollen and slightly hyperemic at upper margin. Right eye normal.

(In another case like this in every respect, sent to me by Dr. W. H. Lueudde, the disc did not show any change whatever—had only perception of light.)

June 24, 1914. Post-ethmoidal sphenoidal operation. Dr. Wright's report: Sphenoidal wall—marked hyperplasia of the bone and the periosteum is markedly infiltrated with products of inflammation in some parts. Some areas of the mucous membrane show marked adenomatous hypertrophy with sub-epithelial oedema. The changes in the soft parts are of a chronic nature, probably a very old process in the mucous membrane.

Middle turbinate—The surface epithelium is papillary and thickened. There is a very great amount of oedematous infiltration of the subepithelial connective tissue. The lymph channels are enormously dilated in it. The blood vessels are not markedly involved. The mucous membrane shows evidence of marked chronic inflammation, long continued and still quite active and there is a great amount of inflammatory change in the bone.

Clinical result. In 9 days after operation, vision 3/30; no headache. In 20 days, V. $\frac{20}{38}$. In 35 days, $\frac{20}{19}$ and normal field; no headache.

March 22, 1915, V. $\frac{20}{19}$ both eyes.

Case 5. E. D., strong, healthy man, 24 years old, referred by Dr. John Green, Jr., and Dr. Louis Hempelmann. My diagnosis:

Hyperplastic sphenoiditis with subacute suppuration. Dr. Green's report: "Seen first Feb. 20, 1914. Right vision 6/5; left vision 6/5+. For 5 years complained of lower half headaches and *temporary blind spells.*

Ophthalmoscope showed right: Mushroom-like swelling of disc with swelling starting abruptly at margin and mounting up. Margins very much veiled, veins a little dilated and tortuous. Apex of disc measured by C D. Refraction about 2 D., so that disc swelling amounted to 4 D. Left same appearances. Disc. measured by 6 D. Retinal level by 2 D. Swelling = 4 D.

"Subsequent observation showed slightly greater swelling in right than left disc; no evidence of choroidal change or of peripheral retinitis. Fields show slight peripheral contraction of right with inversion of red and green fields. On left form field full, blue field contracted, green field larger than red but interlaces in three meridians. Conspicuous clinical feature of the case is the momentary obscuration of vision followed by rapid restoration. Patient closely followed, vision never got lower than right 6/8+. Left 6/5.

March 6th: The day following opening of right post-ethmoidal-sphenoidal cells, vision was raised from 6/6 to 6/4 with the right eye.

March 12th: Day following operation on left post-ethmoidal sphenoidal cells, vision was raised from 6/4 missing 2 letters to 6/4 missing 1 letter.

April 10th: Distinct recession of papillary swelling; right apex measured by 4½ D., and left apex by 5½ D. From this time neuritis slowly subsided.

November 6, 1914: Both discs were at level of retina and fairly well tinted.

Last observation July 12th, 1915; right and left vision 6/4; fields full. Both discs a little pale but showing no other evidence of antecedent inflammation."

Dr. Wright's report of changes in post-ethmoidal-sphenoidal wall. Periostitis with bone markedly hyperplastic and the deeper layers of connective tissue oedematous and there is considerable hyperplasia of the connective tissue.

Clinical Course. Post-ethmoidal-sphenoidal operation, right side, March 5, 1914. Left side, March 11, 1914. Eyes began to improve almost at once (see above, Dr. Green's report). Six days later lower half headache (maxillary and Vidian neuralgia) began to lessen and later ceased. July 27, 1914, a coryza made headache and some increased disc sweling and a paresis of the facial nerve of right side. This diagnosis was confirmed by Drs. Hempelman and M. A. Bliss. This condition lasted 7 days.

August 15, 1914, began another exacerbation of the local inflammation and was followed by vomiting for 36 hours with some headache. August 27, 1914, appeared a paresis of the left facial nerve with a right sided exophthalmos (Drs. Green, Hempelman and Bliss). Intrasphenoidal observation with Holmes pharyngoscope during these periods confirmed the diagnosis of acute exacerbation. By the same means it was known to have been absent before and proved to be absent later (after 14 days) when recovery of eye, facial paresis and exophthalmos was established.

Last observation by me April 10, 1915, confirmed Dr. Green's of November 6, 1914, of recovery. The clinical changes in the sphenoid district had subsided to such a degree as to leave it normal clinically.

Case 6. A. A., aged 22, normal, referred by Dr. A. E. Ewing, October 6, 1914. My diagnosis—Sphenoidal suppuration, R. Dr. Ewing's report: The young woman, 22 years of age, a week previous to the examination noticed that everything appeared double, with considerable headache. At the time of the first examination, October 2nd, the vision in the right eye varied from 20/38 to 20/24; in the left it was 20/20. In the right eye the vision could be improved to 20/20 by a weak concave lens. The muscular disturbance consisted of a slight nystagmus when looking strongly upward or downward. On the 6th there was positive restriction in the motion of the right eye outward and a diplopia which was corrected by a prism of 25° base outward over the right eye; left, 20/24; fields normal; each fundus normal. The nasal examination, made the same day, revealed suppuration from the right sphenoidal sinus. Two days later this sinus was opened. On the 26th the recovery had so far progressed that the diplopia was corrected by a prism of 7° base outward O. D.; the vision had risen to 20/20+, and was the same with +0.37 sph. Three weeks later binocular vision had become reestablished and the eyes were used freely and comfortably, the vision in each eye being 20/20+ without glasses.

This case is of especial interest because of the diplopia that was at first indefinite, the lowering of the vision in the right eye, the accommodative spasm and the nystagmus in extreme upward and downward exertion, all of which combined was an evidence of a general slight oculomotor and optic nerve toxemic involvement. Later the abducens became most affected, probably by reason of gravity of the toxic substance and because of proximity to the infected region, the abducens being the lowest of the oculomotor nerves in their passage through the sphenoidal fissure, and nearest to the post-ethmoidal and sphenoidal sinuses, as well as nearest to the sphenoidal sinus in its course over the clivus and

around the posterior clinoid process of the sphenoid after its exit from the dura mater.

In addition to the actual lesson taught in this instance, there is another presumable one, which is that many of the hysterical amblyopias, and many of the temporary indefinite muscular anomalies and obscure disturbances of the accommodation ordinarily accredited to hysteria, may really be toxemias due to nasal infection.

October 8, 1914, post-ethmoidal-sphenoidal operation. Dr. Wright's report of changes in post-ethmoidal-sphenoidal wall: The mucous membrane of the sphenoidal wall in this case is the site of some fibrous hyperplasia and of some edema. There are small patches of connective tissue in which this hyperplasia is quite marked around moderate sized arterioles. There does not seem much bone change.

Turbinate: This consists of edematous connective tissue beneath the epithelium which is not much altered. The veins and venules are dilated and full of blood and serum, but their walls are not markedly thickened. The acini of the glands are somewhat dilated. There is not much production of new connective tissue nor bone lesion. The case is evidently one of sub-acute inflammation. The wound was uneventful in healing.

In this case the process had lasted probably only a short time. The status of October 6th was precipitated by an acute or subacute inflammation upon the older process.

Case 7. Miss H. M., aged 35, referred by Dr. F. R. Fry and Dr. A. E. Ewing, March 10, 1914. She had suffered violent headaches as long as she could remember, recurrent at irregular intervals (type of vulgar megrim) but getting worse. My diagnosis: Hyperplastic sphenoditis (non-suppurative R. & L.). Dr. Fry's report: She has a parasthesin hypesthesia and hypalgesia in distribution of 5th nerves which I feel certain is of organic genesis. The different kinds of impairment are so-extensive at present. The left pupil is a little larger. They react fairly well. Dr. Ewing's report of eye conditions: March 5, 1914, vision $\frac{20}{15}$ R. and L. Slight blurring of disc margins pathological(?) Slight paresis of right side of face. Advised to consult Dr. Fry. Postethmoidal sphenoidal operation of left side June 5th, 1914; of right side February 11, 1915. On June 1, 1915, Dr. Fry reports a return to normal of above stated changes and Dr. Ewing reports discs normal, possibly a slight blurring stile of left disc margin. A note dated July 6, 1914, at the time of a coryza shows the left disc to have been swollen, 2 diopters. This lasted three weeks.

Dr. Wright's report: Sphenoidal wall shows a marked chronic inflammation with involvement of periosteum; and bone to a moderate extent. Middle turbinate: There is a chronic fibrous hyperplasia of the soft parts involving the walls of the arterioles. The bone shows no marked changes. June 1, 1915, free of pain except slight occasional occipital headache. She has at times a low grade tingling sensation of right side of face.

Case 8. W. K., aged 56, referred by J. W. Charles. A parallel (identical) case with 7, but more marked clinically. I report it for this reason, despite the fact that I have been unable to find the bone I removed and so cannot have the pathological anatomical changes recorded. March 9, 1914. My diagnosis—Hyperlastic sphenoiditis with scant secretion on right side. States that he has had severe headaches "all of his life" of right side. In one attack which I saw it was of great severity in temple, about eye and in occiput and neck. This attack was accompanied by the loss of 2 letters on the vision test card, yawning, drowsiness and withal a marked restlessness which compelled him to get out of bed in the middle of the night, also by vertigo, nausea, vomiting, pallor and sweat. The next day, the attack being over, the pain sense was still better R. but not the sense of taste. He had regained the two letters he had lost. A hyperalgesia R. with more acute sense of taste R. after July 7, 1914. Dr. Charles' report—In 1903 he showed a hyperopia, 2d. R. eye and 2.5 L. eye. Vision $\frac{15}{7}$ R. and L. By ophthalmoscope both eyes normal. In 1912 R. eye V. $\frac{13}{40}$. In 1913 V. $\frac{13}{50}$. 1914, July 1, V. $\frac{23}{192}$ and some clouding of vitreous. Unusually severe headaches; disc blurred.

July 7, 1914. Postethmoidal sphenoidal operation, after which the headaches *stopped altogether* and his *color* became *normal* (his appearance prior to this was evidently that of a low grade sepsis). Vision August 11, $\frac{23}{38}$, the last time he appeared for examination. By telephone he says he is alright and gained 18 lb., June 1, 1915.

Case 9. H. S., aged 35, large, very strong, healthy man, referred by Dr. F. L. Henderson, November 25, 1914, for complete paralysis of accommodation L. eye of six months' standing. He had a sphenoiditis of low grade with moderate hyperplasia and very scant mucopurulent or mucous secretion. Postethmoidal sphenoidal operation November 30, 1914. Accommodation began to return 1 month later and in 3 months more had returned complete. The bone has not yet been submitted to Dr. Wright.

Case 10. R. B., strong, healthy man, 21 years old, referred by Dr. H. S. Hughes. My diagnosis hyperlastic sphenoiditis, non-suppurative. Dr. Hughes' report, July 20, 1914, patient says his vision was normal, that he never had any eye trouble until one month ago, when he noticed the small prints seemed blurred and that he could not do his work with facility. No other especial symptoms and no pain, except frequently he has had some slight, low-grade headache. General history, practically negative. Denies, luetic history or any other trouble of a general nature Smokes little, about one package of tobacco a week. Does not drink to excess. External eye, normal. Vision R. E. $\frac{6}{12}$; L. E. $\frac{2}{50}$. Not improved with glasses. Ophthalmoscope, L. E., nerve head seems hazy in outline throughout. Disc margin being completely lost from 5 to 8 o'clock. Temple quadrant is distinctly pale. At the lower nasal quadrant are several very minute hemorrhages. The maculae region looks hazy and slightly edematous. The retinal vessels have a peculiar and prominent appearance, as though they were suspended or semi-detached. Media clear. Ophthalmoscope, R. E., disc margin comparatively clear. Slight congestion in vessels at lower disc margin similar to that found in left, except very much less pronounced. Optic nerve pale. August 4, 1914, Dr. Gradwohl reports negative Wassermann but a positive Hecht-Weinberg. Fields for form show concentric contraction varying from 20 to 40 deg. Diagnosis, neuro-retinitis; patient placed upon energetic alterative treatment, supported with strychnia. Vision R. E., $\frac{6}{40}$; L. E., Fings. 1 M. July 29, 1914, Dr. Sluder opened left sphenoidal sinus. August 4, 1914, vision R. E. $\frac{6}{50}$; vision, L. E., Fings. 1 M. Accurate fields difficult to take. October, 1914, R. E. $\frac{6}{50}$; L. E. Fings. 2 M. This is the last visual record I was able to take of the patient. Subsequent letters from his family's physician at Springfield, Mo., would indicate that his vision for several months following the above date remained about the same.

August 7, Dr. A. E. Ewing saw the patient in consultation. Dr. Ewing's opinion substantiated my own as regards diagnosis and treatment. He did not think there was any indication for specific treatment but suggested that the nasal treatment be continued.

Postethmoidal sphenoidal operation, July 29, 1914.

Dr. Wright's report of changes in the sphenoidal wall and middle turbinate reveals a moderate degree of hyperplasia of

fibrous connective tissue beneath the epithelium and moderate hyperplasia of the bone.

I know of no particular reason for the total failure to improve this case.

Case 11. Mrs. L. E., aged 26, referred by M. H. Post, September 24, 1908, with the report that her eyes were normal. She had a complete right-sided ophthalmic megrim, 7 years' duration, scotoma scintillans, violent headache (lower half), nausea and vomiting, hemianopsia ambliopia. The attack came every four days approximately. My diagnosis—marked hyperplastic sphenoiditis, R. She grew slowly worse; the attacks became more frequent and more severe. Post-ethmoidal sphenoidal operation R. January 2, 1914. Dr. Wright's report of the changes in the sphenoidal wall. Here is a very marked involvement of the bony structure. The periosteum is greatly inflammed and there is a quite marked hyperplasia of the bone. The soft parts over it are in a state of chronic inflammation. The middle turbinate shows only a moderate change in the soft parts and the bone is not much involved. The surface epithelium is also not much involved.

She became better as soon as the wounds were healed and the reaction totally subsided; and has since then been for the most part well. A coryza re-establishes the syndrome, but it usually does not need local treatment.

In another complete ophthalmic megrim the mucous membrane in the sphenoidal sinus at the time of operation showed, with Holmes' pharyngoscope, a most marked thickening and induration with dryness and pallor. Dr. Wright's report of the changes in the phenoidal wall microscopically are: The inflammatory changes here are quite marked. There is a considerable degree of inflammation of the periosteum and some evidence of hyperplasia of the bones while the soft parts over it are markedly involved in the chronic inflammatory process.

This was a bilateral case, one side only is so far operated (15 mos.). There has been only moderate betterment clinically.

Another in a young woman has been greatly helped by local treatment.

Case 12. A. B., strong healthy man, 30 years old, referred by Dr. A. E. Ewing, January 15, 1915, for a severe serous iritis R., with blood in vitreous. Vision $\frac{3}{120}$ R. eye. L. normal. My diagnosis: Sphenoid suppuration, R. It appeared subacute with no definite hyperplastic features. No headache. He did not accept the proposed surgical procedure. February 7, 1915, he developed an acute coryza. February 10, 1915, he returned. V.

counts fingers at 1 foot, recognizes the movement of hand at 3 feet. The anterior chamber is now full of blood. February 11, 1915, post-ethmoidal sphenoidal operation. The cavity of the sphenoid was found to be large and lent itself to very satisfactory surgical manipulation. The anterior wall was readily cut out with sufficient general shock to lower the blood-pressure so that there was amost no bleeding and withal no syncope. He was then, as it were, a perfect manakin. The Holmes pharyngoscope was at once introduced into the cavity of the sphenoid which showed on that part making the inner aspect of the optic canal, a patch a little less than 1 cm. in diameter which at this center was a bluish gray and thickened and marked by blood vessels, centered there from all directions. It was one of those vascular communications described by Shambaugh and others between the membrane of the sinus and the adjacent cranial cavity—in this instance the optic canal. From its center the thickening began to recede and the color to approach normal. The remaining membrane showed somewhat of a bluish addition to its color. The cavity held a scant secretion apparently opalescent. In 8 days the patch and blood-vessels had vanished, and the eye had begun to improve from what was a progressively desperate state according to Dr. Ewing—5 mos. V. $\frac{3}{75}$.

Dr. Wright's report of the changes in the sphenoidal wall. Hyperplasia M. M. erectile tissue. Enormously dilated. Sinus gorged with blood. No bone involvement, slight periostitis. Sphenoidal wall. This is an exceptional chronic edematous inflammation of the mucous membrane, exceptional in this: the great development and dilatation of the erectile venous sinuses in this situation, 2nd. The thickening of the media of the coats of the radicle arterioles. 3rd. The very moderate amount of bone affection, considering the excessive (for this situation) amount of vascular and fibrous change. There is a marked though moderate amount of periostial thickening, but the bone itself is not materially involved.

Epilogue—Apparently we have here an inflammatory process which has extended along the nerve sheath, if we are to preserve the character of the inflammation the same in the sinus as in the middle turbinate, before marked change is produced in the underlying bone locally in the nose. Mucous membrane shows extensive degeneration with evidence of primary vascular change.

Case 13. Miss A. K., 40 years old, normal, referred December 13, 1913, by Dr. M. H. Post, Jr., for choroiditis, L. V. $\frac{20}{94}$ L.

My diagnosis—Post ethmo-sphenoiditis with edema and pus, L. December 9, 1913, post-ethmoidal sphenoidal operation. At the time of opening the cells were found by the pharyngoscope to contain polyps. Vision has risen to $\frac{20}{24}$. A scotoma remains. She sees a black spot in the upper outer of that (L) eye. Since the healing was complete and vision largely restored I have seen her in 4 coryzas. She lost vision in 3 of the attacks and showed by the pharyngoscope a patch of acute inflammation twice in the sphenoid at the site of the optic canal and once in the post-ethmoid with polyps at this site. In one coryza the patch was in the lower and outer area of the sphenoid and accompanied by severe lower half headache but no loss of vision. Dr. Wright has not examined the bone from this case.

I have a similar case referred by Dr. W. A. Shoemaker with choroiditis, recurrent and great headache relieved by operation with betterment of vision. The bone in this case has not yet been examined by Dr. Wright.

In two other cases of diagnosis of non-suppurative hyperplastic sphenoiditis with headache (lower half), there came at the time of greatest intensity of the pain in one case a loss of consciousness lasting usually from 5 to 10 min., and in the other the sight of innumerable men approaching from the right and countless rats approaching on the floor from the left. In both cases the pain and other features of the case were stopped by the operation to return at the time of a severe coryza and again disappear.

In many of the specimens examined by Dr. Wright, there was no periostitis observed. The cases had no special features such as those above recorded.

In addition to these operated cases I feel that the following cases, which were not operated upon for one reason or another, are of interest in these connections.

Case 14. W. H., aged 20, strong, healthy man, referred by Dr. W. H. Luedde, July 22, 1907. My diagnosis, acute post-ethmoiditis, suppurative with edema. He had presented himself to Dr. Luedde that day, saying that "Three days ago the present trouble began with a sharp pain in right eye; 12 hours later a slight swelling appeared around this eye which lasted 12 hours. The pain continued until today." This morning at 7.30 both eyes became blind. The left eye remained blind about 25 minutes. The right eye can see direction of motions of hand 3 feet, vision of left eye 15-19 by artificial light. Examination showed the right upper meatus of the nose swollen shut and pale (edematous). No pus could be discovered. Effort was made to shrink away the swelling, which was only in small part successful. He

was placed in St. Luke's Hospital and the effort repeated at midnight, unsuccessfully. It was repeated at 6 a. m., July 23, 1907, and followed by the discharge of about a teaspoonful of pus into the throat. Three hours later (9 a. m.) he reported to Dr. Luedde, who found the vision, right eye 15-19, left eye 15-12. The discharge of pus continued intermittently, stopping in ten days. It always appeared between the middle and upper turbinates. Never did any appear in the recessus spheno-ethmoidalis. Four days from the beginning of the treatment the right upper meatus swelled shut again for a few hours (about six hours) the pain recurred to a slight degree and his vision in the right eye fell temporarily from 15-12 to 15-24 for this length of time. From the tenth day he remained normal in every way and continues so at present.

Case 15. O. R., 15 years old, strong, healthy boy, referred by Dr. A. E. Ewing, May, 1911, for beginning optic nerve atrophy, which had lasted one year. My diagnosis—hyperplastic sphenoiditis, R. and L., not far advanced, non-suppurative. Dr. Ewing's report, vision R. E. $\frac{20}{192}$. L. E. $\frac{20}{150}$ with small central scotoma R. Right eye showed narrow pigmented crescent to temporal side of disc. Left eye showed narrow pigmented crescent nasal side of disc and more to temporal side: no headache. He was given a 2½% alkaline saline solution to pour into nose 3 times a day with a phenol spray. In 5 months he showed V. $\frac{20}{60}$ R. and L., two eyes $\frac{20}{38}$. I have had a similar case with Dr. Ewing in a woman 72 years of age.

Case 16. Mrs. J. B. C., 33 years old, referred by Dr. M. H. Post, October 26, 1910, for frontal sinus vacuum headache of 15 years' standing, with asthenopia, high grade. March 16, 1911, I removed by high (cribriform) cut, the L. middle turbinate. It showed (Dr. Wright's examination) a hyperlastic (bone and soft parts) process. The R. side was less troublesome and not operated. She got well and remained so until sent by Dr. J. A. Flury again to me July 8, 1915, with a well marked hyperplastic sphenoiditis, non-suppurative, more marked L., accompanied by moderate maxillary and Vidian neuralgia with a hazyness of the retina and a blurring of the disc of both eyes with vision L. $\frac{6}{9}$, R. $\frac{6}{6}$ metric. She was given a 2½% alkaline saline solution to pour into the nose three times a day and a phenol spray. Improvement began in 2 weeks. September 13, 1915, she reported herself

to be "well." Dr. Flury reported the fundi normal, V $\frac{6}{5}$ R. and L.

I have 3 similar cases beginning 15, 17 and 20 years ago, respectively, as frontal vacuum headaches.

The middle turbinate bones showed hyperplasia of bone and soft parts (Dr. Wright). They remained well after operation until the past 3 years since, which time they have developed a hyperplastic post-ethmo-sphenoiditis, one with polyps above the middle turbinate line. All have lower half headache in great degree and very often; but no fundus changes.

In one case a major epilepsy ceased after a post-ethmoidal-sphenoidal operation. He has been well now 17 years.

Bibliography.

1. Sluder, Greenfield. Some Anatomic and Clinical Relations of the Sphenoid Sinus to the Cavernous Sinus and the Third, Fourth, Fifth, Sixth and Vidian Nerves. Read before the American Laryng. Assn., Atlantic City, N. J., May 11, 1912. Archiv für Laryng. u. Rhin., Bd. 27, Hft. 3. Annals Otol., Rhinol. and Laryng., 1913.
2. Gundlach, C. A. Post-Nasal Observations by Means of the Nasopharyngoscope. Laryngoscope, 1915.
3. Berger, Emil. "Berger and Tyrmann": Die Krankheiten der Keilbeinhöhle und ihrer Bezier. z. Erkrankungen d. Sehorganes. Wiesbaden. Verlag von J. F. Bergmann. 1886.
4. Onodi, A. The Optic Nerves and the Accessory Sinuses of the Nose. Annals Otol., Rhin. and Laryng., 1908. Also "Der Sehnerv. und die Nebenhölen der Nase. Verlag von Alfred Hölder, 1907. Wien.
5. Loeb, H. W. A Study of the Anatomic Relations of the Optic Nerve to the Accessory Cavities of the Nose. Annals Otol., Rhin. and Laryng., June, 1909.
6. Onodi, Ladislaus. Ueber die Beziehungen der Keilbeinhöhle zu der Nervenstämmen des Oculomotorius, Trochlearis, Trigeminus and Abducens. Archiv fuer Laryng. u. Rhin., 1912, II Hft. (July 12).
7. Ewing and Sluder. Headaches Apparently Ocular but Really of Nasal Origin. Their Recognition and Treatment. (By Dr. A. E. Ewing.) On the Nasal Conditions Found in These Cases: With Especial Reference to an Abnormal Relation of the Uncinate Process of the Ethmoid to the Bulla of the Ethmoid. (By Dr. Sluder.) Transactions of the American Ophthalmological Society: Thirty-sixth Annual Meeting, Washington, May 2, 1900. Vol. 9, pp. 60-70.

8. Ewing, A. E. A Point in the Diagnosis of Frontal Headache. St. Louis Courier of Medicine, 1899, p. 370.
9. Sluder, Greenfield. Vacuum Nasal Headaches With Ocular Symptoms Only. Annals of Otology, Rhinology, and Laryngology, March, 1912, Vol. XXI, No. 1, pp. 160-169. Trans. Amer. Laryng., Rhin. and Otol. Soc., 1911.
10. Idem. A Method for the Removal of the Whole or a Part of the Middle Turbinate. Jour. Amer. Med. Assn., June 29, 1907, Vol. XLVIII, pp. 2183-2184.
11. Idem. Etiology, Diagnosis, Prognosis and Treatment of Sphenopalatine Ganglion Neuralgia. Jour. Amer. Med. Assn., September 27, 1913, Part 2, Vol. LXI, pp. 1201-1205.
12. Adamkowitz. Die Lehre vom Hirncompression. Wiener Sitzungsberichte. 1883.
13. Onodi, Ladislaus. The Rhinogenic and Otogenic Lesions of Third, Fourth, Fifth, and Sixth Cranial Nerves. Jour. Laryng., Rhin. and Otol., 1914. Read before the Belgian Soc., Otol., Rhin. and Laryng., Brussels, July, 1913.
14. Sluder, Greenfield. Further Observations on Some Anatomical and Clinical Relations of the Sphenoid Sinus to the Cavernous Sinus and the 3rd, 4th, 5th, 6th and Vidian Nerves. Trans. Amer. Laryng. Assoc., 1913. Archiv. fuer Laryng. und Rhin., Bd. 28, Hft. 1. Annals Otol., Rhin. and Laryng., 1914.
15. Idem. The Correlated Action of the Pharynx and Soft Palate: And Its Effects Upon Post-Nasal Diagnosis. Trans. Amer. Laryng. Assn., 1914.
16. Idem. The Sympathetic Syndrome of Sphenopalatine (Nasal) Ganglion Neurosis, Together With a Consideration of the Neuralgic Syndrome and Their Treatment. Trans. Amer. Laryng. Assn., 1915.
17. Chamberlin, W. B. Report of a Case of Nasal Polypi Involving the Orbit, Frontal Sinus and Anterior Fossa of the Skull. Trans. Amer. Laryng., Rhin. and Otol. Soc., 1913.
18. Sluder, Greenfield. The Syndrome of Sphenopalatine Neurosis. Trans. Amer. Laryng. Assn., 1910. Amer. Jour. Med. Sciences, 1910.
19. Bliss, M. A. The Importance of the Paranasal Sinuses in the Explanation of Pain in the Face, Head, Neck, and Shoulders. Trans. Amer. Neurol. Assn., 1914. Amer. Jour. Med. Sciences, 1914.
20. McBride, P. Diseases of the Throat, Nose and Ear. 1891 (Amer. Edition). P. Blakiston's Son and Co., Philadelphia, U. S. A., p. 352.
Idem. Ueber die Diagnose und Behandlung der Krank-

heiten der Accessorischen Hölen der Nase. Deutsche med. Wochenschr., 1891, p. 221.
21. Patel. (See Sieur et Jacob.)
22. Hajek, M. Erkrank. d. Nebenhölen d. Nase., p. 372. Wien, 1914. Ver. Franz Deuticke.

THE SYMPATHETIC SYNDROME OF SPHENOPALATINE OR NASAL GANGLION NEUROSIS: TOGETHER WITH A CONSIDERATION OF THE NEURALGIC SYNDROME: AND THEIR TREATMENT.

BY GREENFIELD SLUDER, M.D.

I suggest the use of the term Nasal Ganglion for the structure which bears the names synonymously, Sphenopalatine or Meckel's or Nasal Ganglion because this name gives probably the best idea of its location and directs the thought of the clinician more readily and more accurately.*

In 1908[1] I described a symptom-complex which clinicians may recognize as proceeding from disturbances (chiefly inflammatory) in or about the sphenopalatine or nasal ganglion and assigned to the ganglion a causative rôle. That picture is chiefly neuralgic (painful), having, however, a slight, motor, sensory and gustatory complement. Rarely, were added vasomotor or secretory symptoms. From time to time[2] I have cited features which seemed to me of interest bearing upon this region, anatomically and clinically. I called attention to the fact that the pterygomaxillary fossa in which the ganglion lies is tantamount to a paranasal air cell, being surrounded by nasal parts on all sides except its external aspect; differing, however, in that it contained the ganglion, blood-vessels and connective tissue instead of a part of the nasal air; and averred that the entire syndrome was sometimes produced by attack on the nerve trunks[3] which supply the ganglion, *i. e.*, the maxillary division of the trigeminus and the Vidian, in their transits through rigid, bony passways in the body of the sphenoid; and I gave the differential diagnosis. I stated that I believed that the ganglion was

*The term "nasal ganglion" is used synonymously by authoritative anatomists at the present day, although the "Nomina Anatomica" accepted by Anatomical Society at Basel in 1895 (BNA) include that of "sphenopalatine ganglion" only.

attacked by extension of inflammation or its toxins through the walls separating it from the nasal structures. Often it is so close to the nasal fossa at the sphenopalatine foramen as to be submucous.

THE USUAL SYNDROME WITH ITS USUAL FORERUNNER.

A patient presenting all the features mentioned will tell of a coryza of lesser or greater severity—sometimes astonishingly slight and often forgotten, or, it may have produced a post-ethmoidal sphenoidal empyema of greatest intensity. A short time later pain began at the root of the nose, in and about the eye, the upper jaw and teeth, sometimes also the lower jaw and teeth, and extending backward about the zygoma to the ear, making earache; emphasized at the mastoid but always severest at a point 5 cm. back of that; thence reaching backward by way of the occiput and neck, it may extend to the shoulder blade and shoulder (less often to the axilla and breast), and in severe attacks to the arm, forearm, hand, and even the finger-tips. This is the most frequent picture, but at times there may be also a sense of "stiff" or "aching" throat; or of pain (oftener itching) in the hard palate; or pain inside the nasal fossae; or a feeling that the teeth are "too long"; or a perverse sense of taste (rare) or scrotoma scintillans (rare). The sense of taste is slightly less acute over the anterior two-thirds of the tongue on the affected side. Rarely, in the beginning or at the height of the attack it is slightly more acute. The arch of the soft palate is higher on the affected side; the uvula and dimple which forms above it on gagging are deflected to the well side. A slight blunting of sensation is found in the nose and throat as far down as the tonsil on the affected side. There may be a sense of stuffy ears, which are easily inflated with but short relief. I have construed these as tubes which are not opened up normally by the levator palati: and that this happens because the motor function from the ganglion is lessened at the time of the attack of pain. As the pain subsides this symptom disappears.

Clinical Course.—Such is the complete picture, which, however, is rarely presented in full. The motor phenomena, I believe, are most often omitted. The anterior or the posterior portion of

the pain may be absent. I stated that these pains are the same as maxillary (anterior) and Vidian (posterior) neuralgias, excited from within the sphenoidal sinus and that their differentiation laid in the fact that cocainization of the ganglion, stopped the pain when it originated at that point, but did not, when it was made in the nerve trunks central to that point—the sphenoidal district.[3] Should the attack become subacute, there soon develops a tendency toward intermittance. The pain will stop for a number of days or weeks and begin again without recognizable cause. It then runs the cyclical course of a "migraine," or it may, rarely, recur with stabbing sharpness as a tic douloureux. Once the nerve centre has been affected, it seems to remain vulnerable for an indefinite period. The pain may then be rekindled by fatigue, anxiety, apprehension, tribulation, anger, mental shock or strain, or systemic toxemias, which would not make the pain primarily. (A few cases, in my experience, have been of primary systemic toxic origin.)

Treatment.—In some cases, usually recent ones, cocainization of the ganglion is curative. The pain stops and does not return. Applications of 2% silver nitrate or 1% formalin to the sphenopalatine foramen membrane often cure the less severe subacute cases. The chronic severe ones require injection. Alcohol plain, in this district is very painful. I have added 5% phenol to it,[4] which seems to me to prevent much, and sometimes all of the pain. Small amounts—2 to 5 drops—of 95% alcohol with 5% phenol may be injected without an appreciable degree of pain following. Larger amounts—0.5 c.cm.—are followed by considerable pain lasting from two hours to four weeks. Very seldom there may be no pain at all, or, very great pain following the larger injection. The shock of the injection follows the rules which govern nasal surgery in general. For making this application I use a straight needle inserted under the posterior tip of the middle turbinate to a depth of 0.5 cm. or a curved one inserted 0.5 cm. through the sphenopalatine foramen continuing the injection slowly as the needle is withdrawn, because sometimes the ganglion is very near the surface of the membrane. The needle may be guided under observation with the nasopharyngoscope.[9] If the pain be

chiefly anterior (maxillary) it should be placed a little further laterally; if posterior (Vidian)[11] it should be more median, corresponding to the sides from which the maxillary and Vidian nerves approach the ganglion. I have stated that I thought the results of injections of these cases compared favorably with those for neuralgias of the maxillary and mandibular nerves from the zygoma. They are, however, much more difficult to achieve. The nerve cells, according to May, are much more resistant to chemicals than the nerve fibres.[16] And latterly it has apparently been proven by Lannois and Berial[21] that the anatomical modification of the nerve trunks by the injection of alcohol *clinically* is very slight. When any at all, it was periaxial. Particularly is the Vidian neuralgia (the posterior portion of the symptom-complex) difficult of control. It should be most carefully differentiated from like pain produced further back in the nerve trunk by a hyperplastic sphenoiditis narrowing the Vidian canal.[18] Should the first injection prove insufficient, two or three months later I reinject, repeating as often as may be needed. More or less benefit ought to follow each injection. In this way some very severe and highly resistant cases have been cured. I mean by this that not only is the pain stopped, but that should it be rekindled by a coryza, which is always possible, the parts have the power of spontaneous recovery.

M. A. Bliss[5] has emphasized the peculiar demoralizing power of the Vidian pain to which I personally attest. It is different in kind and far greater in such power than pain of local traumatic origin (shoulder and neck bruises).

A. E. Ewing[6] proved that the pain of glaucoma was controllable from the nasal ganglion. I have since had 28 cases, some for simple cocainization and some for injection and found this uniformly true. H. E. Miller[7] with W. H. Luedde[8] proved that injection of the ganglion was in addition to the control of pain, followed by a slight rise in intraocular pressure and then by a definite fall; and that the effect was transitory (of a few days' duration). The control of the pain seems permanent. It does not, however, apparently, influence the course of the disease (Ewing) I have, with M. H.. Post, Jr., proved that the pain

of ulcer of the cornea, iritis and interstitial and phlyctenular keratitis is controllable from the nasal ganglion.

E. M. Holmes[9] proved that injection of the nasal ganglion was curative for some cases of tic douloureux of not only the maxillary (the anterior portion of the symptom-complex) but also of the mandibular nerves.

H. H. Martin[10] has had success in the treatment of these neuralgias by injection of the ganglion.

ACCIDENTS ATTENDING THE INJECTION OF THIS DISTRICT.

With nearly 500 injections, twice I encountered bleeding enough to be of clinical consideration, and once I met such a secondary bleeding (5 days later). Once I paralyzed the adducens. In this case the tissue in the pterygomaxillary fossa was unusually loose, which permitted a very easy flow of the alcohol outward and upward to meet the nerve trunk in the lower part of the sphenoidal fissure. The squint lasted eight weeks. The diplopia disappeared in twelve weeks when recovery was complete. Once I crossed the pterygomaxillary fossa and injected into the sphenoidal sinus. Frequently the patient complains of dryness following the injection. It is actual dryness from paralysis of secretion. It is transitory.

Should cocain make the pain worse the ganglion should not be injected as this too will make it worse. (Once I injected such a ganglion.) This condition is usually transitory.

Elsewhere[11] I have given a detailed description of the anatomical variations of this district, a knowledge of which I think is necessary for the security of this surgery.

The Sympathetic Syndrome.—The above described picture is sometimes supplemented by a sympathetic syndrome very wide in its distribution and wondrously complex, a prominent part being vasomotor and secretory phenomena. And sometimes it happens that these are the *only* symptoms of disturbance in the nasal ganglion. Here too a lesion within the sphenoid cell may give rise to this symptom-complex by irritation of the Vidian in its canal.[3] I think, however, that the sympathetic syndrome occurs less often than the painful syndrome under the same

conditions. But a sharp division is impossible because the sympathetic plays a part in the pain complexes.

Inflammation of more or less severity in the district, usually has preceded the vasomotor-secretory phenomena. They may be aroused by a slight coryza that has had little time for development, and appear with explosive effect, out of proportion to the pathological lesion. The patient in health is for the first time, regardless of the season of the year, suddenly seized with severe and protracted sneezing accompanied by much nasal congestion and thin hot secretion, so profuse as to have him resort to a towel for use as a nose cloth. With the great congestion of the nasal fossae is seen great sensitiveness of the internal nose with great redness (congestion) and swelling of the external nose, and soon thereafter, may appear more or less roughing of the skin from the secretion and the wiping it necessitates. In addition to these symptoms, the eyes are greatly reddened (congestion of the conjunctiva) and bathed in tears of a profusion corresponding to the nasal secretion accompanied by dilatation of the pupil and the appearance of staring. The lids are wide open, giving the appearance of prominent eyes. (One case had a slight exophthalmos.) They are involved almost if not quite simultaneously with the nose. A sense of itching or burning, or a feeling of wind blowing into them accompanies the lachrymation, together with a feeling of discomfort of a peculiar kind which seems independent of the secretion and congestion; and there may be the greatest photophobia (one patient, a lawyer, was compelled to wrap his eyes in a wet towel to exclude light for 36 hours). Work requiring near vision is usually very difficult or not possible under these conditions. Sometimes these symptoms are accompanied by dyspnea with dry râles (asthma).

This description in the main is at once recognized by all of us as "the *terrible* or *terrific* cold" which has been described with great emphasis by patients from time to time. For a number of years I have thought that these were symptoms on the part of the sympathetic which supplies the nasal ganglion, and felt that cocain could be used to control them. Various other thoughts prevented me from drawing conclusions from cases of longer stand-

ing (vasomotor rhinitis, hay fever, paroxysmal sneezing, rhinitis nervosa). During the past year, however, I have had these cases so acute and so severe that they seemed perfect for the experiment. The nasal ganglion was cocainized usually from its internal aspect, that is the sphenopalatine foramen—the side from which the Vidian enters. One-half of one drop saturated water solution (90%+) was applied, sometimes once only and sometimes repeated. The effect was to quickly stop the secretion in the nose and eyes and bring them back to normal appearance. The swollen, red nose (rosacea) and the puffed, red, disabled, staring, tearing eyes became normal, and likewise the nasal fossae; and the photophobia ceased; and the pupils shrunk.

Further experience revealed that these cases in their behavior to cocain were not unlike the painful ones arising from the ganglion. Cocainization (once) was curative for those that were provoked by a slight inflammatory condition. Those arising in the wake of more pronounced change—post-ethmoidal-sphenoidal inflammations—but of short duration, often yielded to a few applications repeated from day to day. Two per cent. silver nitrate and 1 per cent. formalin are helpful in older cases. Severe long-standing cases were sometimes not helped by anything short of injection and then very little or not at all. They required reinjection. A *considerable per cent.* of the *ordinary coryzas* is of *this type.* Deep infection of the membrane which leads to suppuration of the sinuses is of course not to be classed with these cases. When the sympathetic attributes (vasomotor, secretory, etc.) are once added to the picture they are very apt to recur more or less marked in subsequent coryzas.

When the case lasts a little longer, the paroxysms begin to appear irregularly and often settle down into the morning sneezing of "rhinitis nervosa." The clinical course of a given case may be of the sympathetic type pure, but upon questioning closely, it is very often found that a low grade ganglion neuralgic complement exists which the patient refuses to have connected with his nasal disturbances. He maintains that his head, neck, shoulder, etc., pains, are "rheumatism," or "stiff muscles" or "neuritis" or some one of a dozen explanations which are absolutely satisfactory to

him and about which he does not want to have his mind changed. Following these cases further, it appears that this syndrome is subject to subdivision, just as the neuralgic syndrome becomes subdivided and betrays itself as single symptoms, *e. g.*, eyeache, earache, toothache, neckache, etc. So it happens that the sympathetic symptom-complex may present the single symptom—sneezing—or thin secretion, or the eye disturbances which simulate a low grade conjunctivitis with asthenopia; and a few times I have seen a red external nose (rosacea) which seemed to be of this origin and was relieved by treatment.

A sketch of TREATMENT is given above. I have not been able to add anything more, or different from that which has served the purposes for the neuralgic cases. At present I do not see how they can be separated. It is generally admitted that the functions of the sympathetic nervous system, among others, are vasomotor and secretory. Sensory attributes have also been proved for it. Anatomically the fibres of the cervical sympathetic from the nasal ganglion pass downward by way of the Vidian and carotid plexus to the cervical sympathetic and give branches to the cervical nerves and proceed finally to the lower cervical ganglion which is in intimate connection and often fused, with the first thoracic.[12] These ganglia are anatomically in association with or allied to the nerves which in addition to supplying the neck, also make up the brachial plexus and supply the upper extremity. Accelerator fibres for the heart and vasomotor fibres for the lung also pass through these ganglia.[13]

The anatomical and physiological problems of the autonomic nerves (sympathetic) are very complex and a *clinician* may well hesitate approaching them, but it would seem that the knowledge of the present on this subject permits the thought that it is a lesion of the sympathetic elements of the nasal ganglion that explains not only these vasomotor secretory phenomena but also the pain referred into the neck, shoulders, arm, etc.—the Vidian neuralgia—and that these referred pains probably come to pass by virtue of the sympathetic fibres which arborize about cells (Thane, van Gehuchten, Dogiel, Retziens) in the spinal ganglia, of the nerves which make eventually the supply of the neck and

upper extremity. Also the thought arises that it is the anatomical connection of accelerator fibres for the heart and vasomotor fibres for the lungs with the ganglia through which the cervical sympathetic passes (lower cervical and first thoracic) that explains some of the cases of asthma of nasal origin; and that the path of the impulses is from the nasal ganglion through Vidian, upper, middle and lower cervical and first thoracic ganglia through the last two of which pass the heart and lung fibres. Much more physiologic fact is needed before such conclusions can be asserted. I have been unable to find any statement of what influence is exerted over nerve fibres in their passage through a ganglion with whose cells they have no other relation. Moreover, the question may arise whether such a state of things exists physiologically or anatomically, *i. e.*, whether there is not always some connection when the fibres pass through a ganglion. Some influence must be assumed to exist for the above hypothesis. It would also appear to a clinician, to exist.

If the cells of the nasal ganglion are as resistant as those of the semilunar ganglion, it explains how they may for some time resist in an inflamed environment, but when once attacked they may in the same manner resist treatment. So it might be explained that intractable Vidian neuralgia is not unrelated to the intractable vasomotor-secretory phenomena, inasmuch as they are often associated and are alike resistant to treatment. In this connection it should be recalled that the *vasomotor-secretory* phenomena of the nose may be excited (1) from the nerve *endings;* (2) the *neuralgia and sympathetic symptoms* from the nasal *ganglion*, or (3) the Vidian nerve *trunk* within the *floor* of the *sphenoidal sinus*. In the first instance the trunk injection of Otto J. Stein[14] succeeds; in the second instance the ganglion injection may succeed, or need repeating; in the third instance the disorder must be attacked from within the sinus when it may succeed in even the worst cases.[3]

Bach [15] made the observation that the sympathetic in health was not specially sensitive but that it becomes very sensitive if the animal be worried or the nerve becomes congested. These facts readily explain how these cases may relapse from fatigue, anxiety,

apprehension, fright, anger or slight systemic toxemias, inasmuch as the environment of the ganglion and nerve tissues may remain slightly inflamed for almost any length of time and pass under the generic term "catarrh."

I have stated that I thought that the control of glaucoma pain from the nasal ganglion was a nerve blocking[17], and I believe that this is true with the control of the other eye pains mentioned above. The thought now arises that it is the sympathetic which runs through the nasal ganglion to the Vidian, etc. that transmits the pain posteriorly in many of the painful eye troubles.

Therapeutically it has seemed advantageous to stop the pain and photophobia of some of the eye diseases at the nasal ganglion not only for the comfort of the patient but also because some cases have been turned thereby in their course, for immediate improvement of what had been a more or less stubborn condition (iritis, glaucoma, corneal ulcer, interstitial keratitis, conjunctivitis) (which may argue possibly a trophic influence). Cauterization of the membrane over the nasal ganglion (acetic acid) has in some instances prolonged the helpful influence and some were injected with phenol alcohol. In one patient suffering severe photophobia with severe pain in the lower half of the head and neck from a traumatic ulcer of the cornea, full cocainization of the ganglion stopped the photophobia and lower half headache completely and left only the sense of irritation produced by the cinder upon its arrival on the cornea, which was slight. The sense of first irritation remained, carried by the ophthalmic nerve and the "deep and heavy pain" passed through the nasal ganglion and was stopped at that point.

Close scrutiny is required to separate some of the eye disturbances which are referred from the ganglion, from some eye diseases proper.

In one pronounced case of asthma which remained after the hay-fever season, cocainization of the ganglion stopped the dyspnea, and it did not return. In four other cases secondary to post-ethmoidal sphenoidal inflammation in mid-winter of greater or lesser severity cocainization of the ganglion of one side either

stopped or greatly lessened the sibilant râles in the lung of that side and relieved the sense of oppression on that side. And in one case of right-sided sphenoidal empyema, the râles and sense of oppression were on that side only, and were stopped by cocainization of the ganglion.

I believe now that it is irritation of the sympathetic fibres at the nasal ganglion that explains the dilatation of one pupil at the time of coryza rather than blunting of the third nerve function, as I previously thought.[3]

The argument outlined above seems to me applicable in the explanation of pain of cardiac origin (angina pectoris) being referred into the arm, *i. e.,* originating in the heart, the impulse passes by the sympathetic upward to the lower cervical and first thoracic ganglia and then to the spinal ganglia of some of the nerves of the brachial plexus.

Cocainization of the nasal ganglion in four cases of autumnal hay-fever stopped the lachrymation and burning or itching eyes. The effect was permanent in one case and lasted one to seven days in the others. (In these observations I had the assistance of H. E. Miller and C. A. Gundlach.)

Rhinorrhea and *sneezing* with *frequent coryzas* with *asthma* and *fever* but with little or *no headache* are seen in children as a concomitant of *post-ethmoidal sphenoidal* inflammations and, I believe, are *another* phase of the picture described above.

It seems to me that, clinically, there are several types of coryzas, and among these I am disposed to class rose colds, hay-fever and horse, etc., fevers, produced probably by as many varieties of causative agents; and that their actions are selective, one or more being peculiar in that they attack the sympathetic nerve elements in the nose and furthermore, the vasomotor secretory elements often totally independent of the pain-producing elements of the sympathetic. We have frequently seen the coryza manifest by dryness without nasal obstruction, which suggests paralysis of secretion. Bacterial cultures made by clinicians, from the nose, at the present time, fail to differentiate these cases.

These differences may be explicable along the lines of sensi-

tization (as these ideas now stand), *i. e.*, that every one is probably sensitized to or for some extraneous agent which is then for *him* pernicious. As is well known, some individuals are sensitized to or for egg albumen, others for strawberry, others for apple, etc.; others for horse serum, others for the pollen of some grasses, others for golden-rod and ragweed. The latter three classes are those who develop horse asthma and spring and fall hay-fever.

The accompanying case reports present many points in common with hay-fever. Aside from No. 5 the others seemed to me absolutely free of pollens or horses, etc., as etiological factors. They have been clearly of local inflammatory origin. When the causative factors of "coryzas" may be separated, then these cases may probably be separated also. The local treatment of many of them and the few hay-fevers that I have so far had chance to observe has resulted in similar benefits. Dr. J. L. Goodale's[19] text before this Association last year records his observations (with case reports), which seem to me to promise a better understanding of some of the above enumerated problems.

Dr. W. H. Haskin[20] read a text to the American Laryngological, Rhin. and Otol. Soc., 1913, and showed a most exquisite dissection, in which attention was called (with demonstration) to the widespread anatomical connections of, and the recognized physiological phenomena connected with, the sympathetic.

CASE REPORTS.

I append a few case reports, each characteristic of some phase which seems to me to justify the report.

Case 1. Mr. G. M. L., lawyer, aged 35, strong and in every way normal man. I should classify this patient as unusually "normal"; beside physical well-being he has no idiosyncrasies known. He is not sensitized along any line now known. He does not have hay-fever or horse asthma. He consulted me December 15, 1914, for what he said was the "worst cold" he had ever had, of three days' standing. He did not have headache, but his mental processes were so slow, together with such a tendency to confusion that he was unable to do his work in the courts with justice to himself or client. He complained also of

weariness but did not feel sick enough to take to his bed. Examination showed a pronounced post-ethmoidal sphenoidal suppuration R. and L. Anterior two-thirds of nose normal. He responded rapidily to acetphenetidin internally and local cleansing and draining. In five days he said he felt well enough to go into court again, and he did so, everything being satisfactory. I did not see him again for two weeks, when he again presented himself for examination, saying he felt well. The evidence of the local trouble had nearly disappeared. I asked him to return again for examination in three weeks and to continue the use of his cleansing nasal solution. In two weeks, however, he presented himself, saying that two days before, while seated at his fireside, reading, at 9 p. m., he was suddenly seized with frequent sneezing, nasal obstruction, profuse hot, watery secretion and tearing so profuse, as he expressed it, that in about two hours all of the handkerchiefs of the family had been used, as well as all the face towels, and he was driven to use the bath towels, and then used nearly all the supply of them. And, that when he was not wiping his nose he was busy wiping his eyes. With these symptoms was a photophobia which rapidly increased until he was compelled to go to bed and put out his light, but even then enough light from the gas-lighted street entered his room to "hurt his eyes," and finally he was compelled to wrap them in a wet towel to exclude every trace of light. He remained in bed in this condition two nights and a day. At this time he again presented himself with a rhinorrhea although profuse, was, as he said, very much better than it had been. His eyes were red and itching and streaming tears, his pupils were widely dilated, with still some photophobia, his lids were staring wide open and his eyes seemed to protrude slightly, his external nose was quite red and markedly swollen and slightly chapped from wiping. He said his chest felt "full." His windpipe and into the bifurcating bronchi was bright blood red. No râles in chest; temperature nomal. He said he thought that if the local nose and eye trouble could be stopped he would feel well. I cocainized the nose anteriorly, without effect, and then cocainized the ganglia by painting the sphenopalatine foramina ½ drop saturated water solution 90%+. This was repeated three times at five-minute intervals with marked benefit each time. The nasal obstruction, rhinorrhea, lachrymation, mydriasis, rosacea, and appearance of exophthalmos vanished. He looked normal, and said he felt so. There was a slight return of the symptoms in 24 hours, which again yielded to cocain, and again in another 24 hours. He then remained free of symptoms until February 10, 1915, when he returned because of another "cold" (coryza), presenting again the

above described picture, much milder, however, in every way; but this time, accompanied by pain in his ear, mastoid, occiput, neck, shoulder blade, and shoulder, not very severe. This time he had slight dyspnea and a few dry râles in the first 24 hours. This time he did not show post-ethmoidal sphenoidal suppuration but only congestion of the olfactory fissure.

This case is at once recognized as the one from which the above description was taken. It is the most acute, severe and complete case that I have seen. Many times in the course of 20 years have I heard this state described by patients almost always emphasized by the statement, "No physician ever thinks I'm truthful when I tell this—They (the coryzas) are *awful!*" Many times have I tried to have the patient return to me in the midst of the attack. They are not *very* frequent, however, and the patients usually describe them as occurring at long intervals and often prostrating him; or milder attacks being of short (24 hours) duration he may not recall his promise soon enough. However, since this case impressed itself on me I have learned to recognize the milder types which prove to be rather frequent. They may have little or no tearing or little or no rosacea, or little or no photophobia. The rhinorrhea is more profuse and sometimes the only symptom.

Case 2. Miss E. C., 28 years old, consulted me June, 1914, because of "hay-fever" (paroxysmal sneezing with secretion), which had lasted uninterruptedly six years, accompanied by constant discomfort referred to her eyes with slight constant lachrymation and slight Vidian neuralgia (see above) which was intermittent and sometimes severe. She had a low-grade (non-suppurative) hyperplastic sphenoiditis,[18] but the entire symptom-complex was controllable from the nasal ganglion which I injected[11] with phenol-alcohol with relief of all symptoms, now for one year.

Case 3. H. H. F., aged 32, strong, normal man, consulted me March, 1912. He had an intractable low-grade conjunctivitis, which was left in the wake of a "bad cold in his head, four years ago." Every coryza makes it worse. Cauterization of the sphenopalatine foramen membrane with trichloracetic acid four times at two-week intervals gave prolonged relief. Coryzas rekindle the trouble, but he comes to be comfortable again in a short time.

Case 4. H. G. L., aged 13, small boy, under strength. Consulted me November, 1914. He had a profuse rhinorrhea with great morning sneezing, accompanied by great morning photophobia and moderate *exophthalmos*. He has a high-grade hyper-

plastic sphenoiditis. Sometimes he has slight asthma. Treatment of his nose has thus far relieved the photophobia and nearly all the sneezing. His eyes are in what seems to be normal position in his sockets.

Case 5. Mrs. J. S., aged 46, my patient since 1898, for many years has had vernal hay-fever of full severity accompanied by red and swollen nose and tearing eyes. Cocainization of the nasal ganglion a few times in the course of the spring months is sufficient to carry her through the attack with only a very slight morning sneezing, on irregular days. Her external nose, however, becomes red and swollen at any time of the year from the slightest irritation of the internal nose and remains red without recognizable cause much of the time. Silver nitrate applied to the sphenopalatine membrane two or three times a week out of hay-fever season brings the appearance to normal. It then remains so for long periods, to be excited again from within the nose. In the hay-fever season she has dyspnea with dry râles equally distributued R. and L. Cocainization of the nasal ganglion of one side will *stop* the *râles* on that side. All treatment known to me prior to the spring of 1914 was in vain. At that time I began the cocainization of the nasal ganglion and the treatment of the rosacea followed that.

Case 6. Mr. W. C., aged 24, very strong, large, normal man. My patient all his life, whenever a rhinologist was needed and intimately known to me in every way, consulted me October 30, 1914, for a slight "cold in his head," which, as he said, he would ordinarily have not noticed; but for some special (social) reason he was anxious "for tomorrow" to be relieved. I gave him some small doses of calomel and told him to omit any local treatment because the local disturbance was so slight. Two days later he returned stating that his "cold" had taken a most unusual turn—that he had been awakened in the middle of the night with much sneezing and watery, running nose accompanied by smothering and wheezing. Examination which at first was negative now showed well-marked inflammation of the membrane over the sphenopalatine foramina. He had no other symptom of any kind. The dyspnea had diminished much. Cocain applied to the foramina relieved it altogether. Phenol applied to the district prolonged the relief. The following night he had a slight return of it. The inflammation disappeared from recognition in a few days more, with recovery. Six weeks later he returned, saying that he again had been awakened in the night with smothering, wheezing and running, watery nose. This time he had slight pain in his ears also. This time the attack was slight with slight

changes locally, the same as above cited. Another slight recurrence happened four weeks later. Eight weeks after last note he developed an acute sphenoidal empyema with dyspnea, râles, sneezing, running, watery nose and moderate headache in ears, occiput and neck. This again yielded easily to treatment but did not get entirely well, when after six weeks' duration he developed vertigo and mental confusion to a most annoying degree, accompanied by the peculiar depressant power of the posterior headache (Vidian neuralgia) to a marked degree. (His disposition is normally most cheerful and confident.) (That which I mention as vertigo in these cases is almost never a sense of rotation. It is a sense of the earth shifting from side to side or forward and back or sinking out from under them.) At the present (May 15, 1915) he is well again.

In one of his years at college in Connecticut he had had some kind of a coryza, accompanied by more sneezing than he thought usual with his coryzas, but this is the only part of the above experience that was not new to him.

Case 7. Miss J. B., aged 24, consulted me June 10, 1914. She had been my patient five years before for some trifling acute trouble of short duration. Present history—For three years has been subject to attacks of iritis, with photophobia, redness and pain not only in eyes but extending to occiput, which would get nearly well and then continue in low-grade for months to be rekindled from causes unknown. The condition is much better than its worst, but far from well. The sphenopalatine foramen membrane of the left side is inflamed and thickened. The iritis is always on left side. Cocain applied to foramen stopped the discomfort in eye and occiput in five minutes. It did not return. Silver nitrate and acetic acid applications were made to complete the treatment. The redness, pain and photophobia of the iritis did not return after the cocain application. Two weeks later the eye was declared by her ophthalmologist to be well.

Case 8. Mrs. E. C., aged 30, became my patient February 10, 1907, for acute empyema of right frontal sinus, which recovered as an ordinary severe coryza. It recurred several times with much pain and in November, 1908, I removed the middle turbinate high up, which gave a large outlet to the sinus and cessation of all symptoms. A low-grade hyperplastic process in the anterior ethmoid and frontal region existed then, or was started that year, which has extended backward to involve the post-ethmo-sphenoidal region. Great pain of maxillary and Vidian distribution began to develop, occasionally, in 1911 and 1912, which became more frequent and severe. Occasionally a

coryza made post-ethmo-sphenoidal suppuration. A Hajek post-ethmo-sphenoidal operation was done on the same (right) side in 1913, followed by irregular intermittent treatment with marked relief from pain. Later, in 1913, she began to complain of constant slight watery discharge from left nostril, which was proven to be secretion from membrane in general. The sphenopalatine foramen district, later, began to show changes and treatment—silver, acetic acid, cocain—was directed to it. The secretion continued and increased. She had an occasional ganglion neuralgia of the left side. On November 15, 1914, I injected the nasal ganglion, left, with phenol-alcohol, since which she has been *free* of *discharge* and has not, so far, had a recurrence of pain.

In my text of 1910[2b] I reported four cases of nasal ganglion neuralgia, each for some special feature. I should like now to add others, each for a special feature.

Case 9. Mrs. S. A., aged 30, consulted me January, 1913. She had had a cyclical nasal ganglion neuralgia, left, severe for eight years. She was a professional violinist for the concert stage. The pain interfered with her practice until she was compelled to consult physicians. It was declared to be a "professional cramp" by the noted neurologists of Russia, Germany, France, and England. She was advised to stop playing the violin, which was "as dear as life itself" to her. This, together with the depressant nature of the Vidian pain made a state of mind for her exceeding hard to bear. The anterior, maxillary part of the pain was controlled by the first injection of phenol-alcohol. The posterior (Vidian) pain required a second injection. For a year and a half she has been free of pain except at the time of a coryza, which was of short duration. She is able to practice and play in concerts and do an unusual amount of teaching (10 hours a day).

I have seen a bilateral nasal ganglion neuralgia pronounced a "piano cramp" for the same reasons that led to the error in this case.

Case 10. J. A., aged 20, strong, healthy, consulted me April 1911. He had a well-marked nasal ganglion neuralgia, left, with constant pain, sometimes less and sometimes more. He was an enthusiastic golf player. It was declared to be a "golf arm" by his physicians (internists and surgeons). Three injections of phenol-alcohol were required before relief was complete and permanent. He has had recurrences from coryzas which have not, however, needed treatment. He has been free of pain for three years.

Case 11. S. A., aged 23, normal but not up to full strength, consulted me October 25, 1912. He showed at that time a hyper-

plastic postethmoiditis most marked over left sphenopalatine foramen. He had had for 10 years a severe cyclical nasal ganglion neuralgia, left, recurring once in three to six weeks. The attack was always accompanied by *scotoma scintilans, aphasia* and *amblyopia* of short duration. I injected the left ganglion three times with phenol-alcohol. For two years he has been free of the attacks except once excited by a coryza, an acute postethmoidal sphenoidal suppuration, when he had the return of one attack. It was accompanied by *scotoma scintilans, aphasia* and *amblyopia.* The acute condition passed off as a bad coryza. This was a year ago.

Case 12. S. Y., aged 50, normal man, had throughout his life what I should term "ordinary" coryzas beginning with sneezing lasting three or four hours and watery discharge of usually one day, after which, nasal obstruction for two or three days, followed by thick mucopurulent secretion. Very seldom, a few times in his life, he had slight headache of a day or two duration. In 1912 he developed a type of coryza manifest by watery secretion and sneezing only. The obstruction and suppuration were omitted. During that year he had four such attacks, all much milder than his previous attacks. In 1913 he had added to this a sharp complete nasal ganglion neuralgia which harrassed him more or less for two months and a paroxysmal morning sneezing lasted two months longer. Since 1913 he has had six such attacks, each with more or less eye discomfort added to the profuse watery secretion and great sneezing with pain in and around right eye; earache and stuffiness, pain in mastoid, occiput, neck, shoulder-blade, shoulder, arm and forearm. In this time he has not had the mucopurulent discharge of former times. The sphenopalatine foramen membrane is markedly inflamed, and once he had a postethmoidal sphenoidal inflammation well marked.

This case shows how the sympathetic elements once added to the clinical factors have recurred with each coryza over a period of three years.

Bibliography.

1. Sluder, Greenfield. The Rôle of the Sphenopalatine (or Meckel's) Ganglion in Nasal Headaches. New York Med. Jour., May 23, 1908.
2. Idem. (a) The Anatomical and Clinical Relations of the Sphenopalatine (Meckel's) Ganglion to the Nose and Its Accessory Sinuses. New York Med. Jour., August 14, 1909; Trans. Amer. Laryng. Assoc., 1909

(b) The Syndrome of Sphenopalatine-Ganglion Neurosis. Amer. Jour. Med. Sci., December, 1910. Trans. Am. Laryng. Assn., 1910.
(c) Further Clinical Observations on the Sphenopalatine Ganglion (Motor, Sensory, and Gustatory). New York Med. Jour., April 23, 1910.

3. Idem. Some Anatomic and Clinical Relations of the Sphenoid Sinus to the Cavernous Sinus and the Third, Fourth, Fifth, Sixth and Vidian Nerves. Annals of Otology, Rhin. and Laryng., September, 1913. Trans. Amer. Laryng. Assn., 1912. Archiv fuer Laryng. u. Rhin., Bd. 27, Hft. 3.
4. Idem. A Phenol (Carbolic Acid) Injection Treatment for Sphenopalatine Ganglion Neuralgia. Jour. Am. Med. Assn., December 30, 1911, Vol. LVII, p. 2137.
5. Bliss, M. A. The Importance of the Paranasal Sinuses in the Explanation of Pain in the Face, Head, Neck and Shoulders. Trans. Am. Neurological Assn., 1914. Am. Jour. Med. Sci., 1915. Amer. Jour. Med. Sciences, 1914.
6. Ewing, A. E. Pain of Acute Glaucoma Relieved by Cocain Applied to Meckel's Ganglion. Am. Jour. Ophth., December, 1908.
7. Miller, H. E. Intraocular Tension in Glaucoma Lowered by Injection of Sphenopalatine Ganglion. Proc. Oto. Laryng. Soc., St. Louis Med. Soc., March 2, 1913. Index of Oto.-Laryng., Vol. III, No. 4.
8. Luedde, W. H. Am. Jour. Ophth., October, 1912.
9. Holmes, E. M. The Intranasal Treatment of Meckel's Ganglion. Trans. Am. Laryng., Rhin. and Otol. Soc., 1913; also Annals of Oto., Rhin. and Laryng., 1913.
10. Martin, H. H. Some Recent Surgery of Cranial Nerves for the Relief of Headaches and Other Neuroses. Southern Med. Jour., Vol. XII, No. 3, March, 1914.
11. Sluder, Greenfield. Etiology, Diagnosis, Prognosis and Treatment of Sphenopalatine Ganglion Neuralgia. Trans. Section for Oto.-Laryng., Amer. Med. Assn., 1913.
12. Quain. Anatomy; 11th edition, Vol. III, Pt. 2.
13. Langley. Schaeffer's Text-Book of Physiology.
14. Stein, Otto J. Some Observations on Hyperesthetic Rhinitis. The Laryngoscope, 1908. The Treatment of Hyperesthetic Rhinitis. Chicago Med. Recorder, July, 1908. Hyperesthetic Rhinitis. Interstate Med. Jour., July 1910.
15. Buch, Max. Die Sensibilitaetsverhaeltnisse des Sympathicus und Vagus mit vesonderer Beruecksichtigung ihrer Schmerzempfindlichkeit im Bereich der Bauchhoehle. Arch. f.

Physiologie, 1901, pp. 191-221; St. Petersburg. Med. Wochenschr., 1901, N. F., XVII, 131 and 141.

16. May, Otto. Functional and Histologic Effects of Intraneural and Intraganglional Injections of Alcohol. British Med. Jour. August 31, 1912, p. 465.
17. Sluder, Greenfield. Etiology, Diagnosis, Prognosis and Treatment of Sphenopalatine Ganglion Neuralgia. Jour. Am. Med. Assn., Sept. 27, 1913, Pt. 2, Vol. LXI, pp. 1201-1205.
18. Idem. Hyperplastic Sphenoiditis; And Its Clinical Relations to the Second, Third, Fourth, Fifth, Sixth, and Vidian Nerves and the Nasal Ganglion. Trans. Washington Univ. Med. Soc., March, 1915. Trans. Am. Laryng. Assn., 1915.
19. Goodale, J. L. Studies Regarding Anaphylactic Reactions Occurring in Horse Asthma and Allied Conditions. Trans. Amer. Laryng. Assn., 1914.
20. Haskin, W. H. Occular Manifestations in Nasal and Aural Diseases Which Probably Indicate Involvement of the Sympathetic Nervous System. Annals Oto. Rhin. and Laryng., 1913.
21. Lannois and Berial. Histological Examinations of the Superior After Alcohol Injection. Rev. Lebd. de Laryngol., Mar. 7, 1914 (review in Index and Digest of Oto-Laryng., pub. by the Laryngoscope, 1915, p. 501, No. 811).

THE EFFECTS OF RADIOACTIVITY UPON NASO-PHARYNGEAL FIBROMA.

BY D. BRYSON DELAVAN, M.D.

At the end of more than a decade since my last articles upon the treatment of naso-pharyngeal fibroma, I again wish to direct attention to it.[1] Although by no means a new subject, as the literature will abundantly show, it has seemed well to review it from time to time, in the hope that poor methods might be demonstrated as untrustworthy or, better still, that good methods should be proved and their superiority clearly placed before the surgical world.

The spark drawn by the kite of Benjamin Franklin could hardly have stimulated even his fertile imagination to an appreciation of the possibilities of applied electricity. The full import and value of any great scientific discovery is something which cannot be realized in a moment. For the development of its practical possibilities, there is need of much time and of infinite labor at the hands of many men. Year by year, old methods are supplanted, not alone by new and original ones adapted especially to the particular object in hand, but, more often, by the application to them of principles already understood and utilized in other directions. This has been particularly true in the department of radiology, which is constantly finding new fields in which to exercise its usefulness.

The value of radiology in the treatment of fibroma in various parts of the body, especially the uterus, has already been somewhat extensively exploited. Of its application to the treatment of fibroma of the naso-pharynx, however, nothing, so far as I am aware, has up to this date been said. It has seemed desirable, therefore, to bring this subject before you in the hope that the method may be given fair consideration and trial. Its success would mean the closing of one of the darkest chapters of surgery.

By naso-pharyngeal fibroma is meant that rare form of growth which, composed mainly of connective tissue, and highly vascu-

lar, usually takes its origin from the basilar process of the occipital bone and extends downward into the retro-nasal space, occluding the natural passages, creating pressure upon the parts in its vicinity, and in many cases giving rise to more or less frequent and abundant haemorrhages. The period of the greatest activity of its growth is about the time adolescence. Following this, the tendency to its enlargement diminishes, and, in fortunate cases, if enough time be allowed and the conditions due to the presence of the tumor be not too urgent, it may gradually disappear. Such a result, however, is very unusual. In nearly every instance the conditions arising from the presence of the growth are so serious as to urgently demand relief. This has been recognized for many generations and almost endless methods of cure have been devised.

Heretofore, three types of methods have been presented:

(1) Removal of the growth after preliminary operation for the removal of obstructing parts.

(2) Removal through the natural passages by avulsion, or with the cold snare; and

(3) The reduction of the size and of the vascularity of the tumor by electrolysis or by the injection of various chemicals, followed by the removal of the mass thus reduced by means of the galvano-caustic loop.

Of these methods, the first is illogical, unsurgical, and, as statistics abundantly prove, deadly. Shock from the preliminary operation is severe, haemorrhage is profuse and recurrence is common. In spite of this, it gained the support of the most eminent surgeons of many generations, and even to-day has its adherents.

The second method is a vast improvement upon the first, but is nevertheless liable to provoke serious haemorrhage and shock and to be followed by recurrence of the growth.

The third method of procedure is by far the best, as it is neither followed by shock, haemorrhage, nor the deformity resulting from the extensive removal of important parts. On the other hand, however, the application of the electrolytic needles is a tedious process and sometimes is attended with considerable pain. While the application of the needles and the manipulation

of the galvano-caustic ecraseur require much experience and skill, a statistical comparison of the three divisions of treatment above referred to leaves no doubt as to which is to be preferred. Thus, of 27 cases removed after severe preliminary operation, 59.25 per cent. were cured and 25.9 per cent. died. Of 41 cases removed through the natural passages by avulsion or the cold snare, 95 per cent. were cured, 5 per cent. died. Of 66 cases treated through the natural passages by electrical methods, 100 per cent. were cured. But a better method even than this has lately been presented to us.

For several years past much attention has been given to the treatment of uterine and other tumors, of the order of the fibromata, or myxomata, by means of the X-ray and of radium. Many cases have been experimented upon, and a sufficient number have been recorded to make it possible to begin to draw conclusions as to definite results. Both in the United States and in Europe, the method has gained strong advocates, and if in some instances the enthusiasm of these seemed unduly sanguine, even the most conservative must admit that the success attained renders the method at least worthy of the respectful consideration of the gynaecologist; while the similarity of type between the uterine and the pharyngeal growths at once challenges the interest of the laryngologist in the new treatment.

Thus, among its advocates in this country may be mentioned Abbe,[2] Kelly,[3] Tousey, Frank and Stern[4]; and in Europe, Krönig, Gauss, Bumm, Wernekro, and Doderlein,—all of whom report favorably upon it and recommend it.

Pfahler reports of 20 cases, 16 cured, 80 per cent.

Kohler[6] reports of 80 cases, tumor reduced in size, 30 per cent.

Mohr collected 669 cases, cured 56.2 per cent.; improved, 17.9 per cent.; cured and improved (no details) 13 per cent; not cured, 11 per cent.

These statistics are somewhat vague, but are suggestive at least.

In Mohr's collection of cases, the tumor actually disappeared in only 5.3 per cent. These were mainly cases of uterine fibromata, presumably of considerable size and somewhat remotely situated. Fibromata of the naso-pharynx are relatively much smaller and much more directly accessible.

The success of the radium treatment in naso-pharyngeal fibroma would not necessarily depend upon the absolute disappearance of the growth. It is a well recognized fact that this, unlike other new growths, manifests its greatest activity during the years of adolescence and early youth. Towards the approach of the eighteenth year the activity of its development steadily decreases. After this period its tendency is to diminish spontaneously, and finally to disappear. If, therefore, the size of the tumor can be controlled during the earlier years and until the period of its activity has been passed, nature herself will often intervene and by her own processes render artificial interference unnecessary.

The most hopeful cases seem to be those of slow development, occuring in older rather than in younger patients. But even in the case of rapidly growing tumors in those far removed from the period of retrogression, the success attained by the use of radium in other types of fibroma would hold out strong hope for its usefulness in these. There is reason for believing, moreover, that the effect of the radium upon them is active and profound, and that more may reasonably be expected than a moderate reduction in their size.

To Dr. Robert Abbe, of New York, belongs the credit of being the pioneer in the use of radium in the United States. For its application to various organs of the body he has originated many ingenious devices, none more so than that intended for use in the nasal and naso-pharyngeal regions. A description of this will be found interesting. In the application of the radium, two objects are to be gained. First, the parts to be treated must be exposed to the rays; and, second, the healthy surrounding parts are to be protected from them. It is not necessary that the radium should be introduced bodily into the substance of the tumor. All that is required is the exposure to the rays of the surface of the growth. In order to carry the radium to the desired part, Dr. Abbe uses the following simple method:

A tube of celluloid, about 3/16 of an inch in diameter and with one end closed like the end of an ordinary test-tube, is cut to the proper length. In the bottom of the section of tube, is put the radium. Upon it is packed a bit of cotton, or gauze, to keep it

in place. The end of a handle made of stout wire is thrust into the tube and the tube is secured to the handle by a wrapping of adhesive plaster. For the protection of the normal parts, a piece of thin sheet-lead, of proper size and shape, is adjusted to the outside of the tube and retained in place by a sufficient wrapping of india rubber gauze, the side covered by the lead being directed away from the tumor.

In using this device, one of the nasal cavities of the patient is first locally anaesthetized and the radium carrier, properly lubricated, is then passed backward through it until the radium is brought into proper relation with the growth. As the blood vessels of the tumor are more abundant near its surface, and as the rays penetrate at least a quarter of an inch, the treatment is entirely effective in accomplishing the desired result of profoundly affecting the blood vessels and thus causing by degrees the reduction of the size of the growth.

Should the radium treatment of naso-pharyngeal fibroma prove as effective as it promises and as we already have good reason to hope that it may, we shall be able to congratulate ourselves and the world that the unhappy record of surgical failure made in the past will have been forever closed.

Incidentally, again, another leaf will have been added to the wreath of fame which so justly covers the brow of Madame Curie.

REFERENCES:

1. Transactions American Laryngological Association. Vol xxiii, 1901; Vol. xxv, 1903.
2. Abe: Medical Record, March 6, 1915.
3. Kelly: Jour. Amer. Med. Assn., Aug. 22, 1914.
4. Frank and Stern: N. Y. Obstetrical Society, May meeting, 1915.
5. Pfakler: Fortschr. a. d. Geb. d. Roentgen, 1913, p. 13.
6. Kohler: Surg. Gynolcol. and Obstet., May, 1913, p. 442.
Mohr: Fortschr. a. d. Geb. d. Roentgen, 1913, p. 105.

Discussion.

Dr. Cornelius G. Coakley, New York City: Dr. Francis Carter Wood has been experimenting, as all know, on various animals with radium; he has also done some clinical work with this agent. He has been kind enough to use it in several cases which

I have sent him during the past year and a half. In a case of epithelioma of the nose radium had a very favorable effect. The patient had a bad case of arterio-sclerosis and died from cardiac trouble. All trace of the epithelioma had disappeared. One case of papilloma of the larynx was cured by radium. The papilloma had existed from early childhood to the age of forty or more. In another case treated by him there was an angio-fibroma which completely filled the nasal cavity, the mass being visible without a nasal speculum. He used eighteen milligrams in a very small glass tube wrapped in ordinary adhesive tape. This was thrust into the nose, and was followed by profuse bleeding. At the end of two weeks no change in the mass could be noted. For some reason the boy did not return to the clinic for eight or ten days, and when he returned it was found that the mass had decreased in size. A brass capsule containing eighty-three milligrans of radium was then inserted, the posterior end of this tube extending into the posterior naso-pharynx. This was left in for twenty-four hours. The excoriation all around the face was simply remarkable. No X-ray burn ever compared with this burn. Dr. Wood told me I need not worry about it, as it would disappear, which it did. The radium was applied in February, and the inside has not yet completely healed. The patient can breathe through the nose, however, and it is possible to look right through into the naso-pharynx. The mass is attached to the posterior wall of the nares and apparently somewhere in the posterior ethmoidal region on the left side. Since the radium has been used the hemorrhages which the patient had at irregular intervals have almost entirely ceased. Radium will probably cure this fibroma. A smaller dose in this case would probably have been better.

This is not the only burn which has come under my observation. I recall a case treated by Dr. Kelly of Baltimore, in which there was a most terrific burn, resulting in extensive infiltration and suppuration. That was a year ago last December. There was a recurrence of the epithelioma of the larynx and the patient went down sometime in March for further treatment. The radium was used without external reaction, but with such exten-

sive internal reaction, with swelling of the arytenoid folds and aryepiglottic tissues, that it was almost necessary to do a tracheotomy.

In the casé I cited the boy had had no treatment for a week, when superficial ulceration appeared all over the skin of the nose and cheek. It was extraordinarily painful. The pain following the use of radium is what patients object to. There is no question of its activity.

Dr. Otto T. Freer, Chicago: With radium I have succeeded in causing disappearance of the base of an intranasal round-celled sarcoma, most of which had been removed by excision. I have also completely arrested extensive nasal tuberculosis with radium aided by excision.

In regard to nasopharyngeal fibroma, the great density, size and the ramifications of these growths would make radium, with its moderate penetration, seem too slow to effectively cope with so rapidly recurring a tumor-form. Aided by excision, however, radium should be of value to prevent a return of the growth.

Adrenalin and pituitrin as preventives of bleeding have made nasopharyngeal fibroma a safer object of pernasal surgery than formerly. I have recently removed through the nose a large growth of this kind filling the naso-pharynx and the right naris completely, also sending an extension into the sphenoid sinus. The instruments used were knives, large ring curettes, my pernasal forceps and the largest Grünwald punch forceps. There was complete recovery after the second operation. The hemorrhage was considerable but I am sure that it would have been formidable if I had not had the advantages of pituitrin and adrenalin. The knife and curette are more radical and accurate than the hot snare.

I was interested in the recovery reported by Dr. Coakley. Dr. Frank Edward Simpson, of Chicago, who is a radium expert, has told me that he has never seen more than blistering after his use of radium. I would like to ask Dr. Coakley how long after the use of radium the severe burn he mentioned appeared and how long the radium was used.

Dr. Delavan, closing the discussion: I cannot conceal my

great satisfaction with regard to the case which Dr. Coakley has reported. I have been studying this matter of naso-pharyngeal fibroma ever since I was an under-graduate student. I have seen the best surgeons operate upon them with unsatisfactory, and often with very bad results. Statistics show unmistakably that surgical procedures of the old-fashioned radical kind are dangerous. As already stated in my paper, the statistics of their results show a high percentage of mortality—26 per cent.—and even this figure is probably far below the truth. Evulsion, removal with the snare, and other such methods are often followed by hemorrhage and in certain cases by death. As far as I can learn from cases collected and studied there have been five deaths in a hundred, as the result of shock or hemorrhage. There is always, also, the danger of recurrence.

The application of radium requires much experience and skill. Care must be taken as to several factors, especially the strength of the radium used and the duration of the exposure made. Properly handled accidents such as burning of adjacent healthy parts, over-exposure and the like, may generally be avoided and the ultimate results, both as to freedom from unnecessary irritation and success with regard to the effect upon the growth, made far more satisfactory.

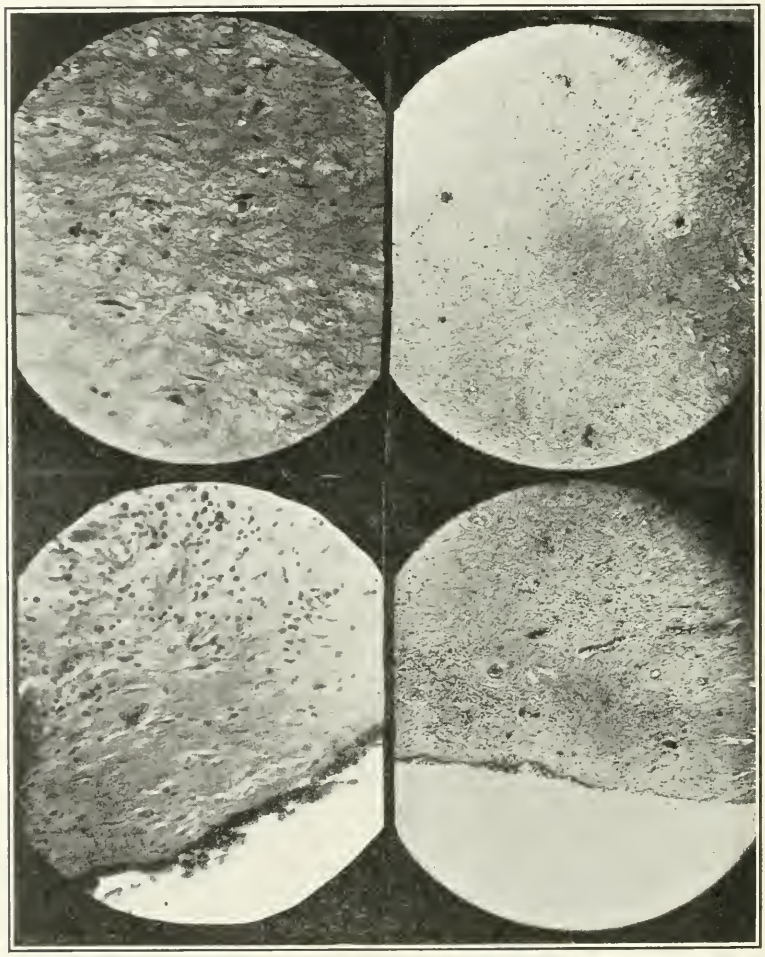
TRUE MYXOMA OF THE RHINOPHARYNX-REPORT OF TWO CASES.

BY VIRGINIUS DABNEY, M.D.

It is because of the extreme rarity of a pure myxoma in the rhinopharynx that these cases are reported; indeed, such a tumor is infrequent anywhere in the body, but especially in the postnasal space, where the invasion of fibrous elements in new growths seems the rule. In fact, Adami speaks of the myxomata as tumors composed "in the main" of isolated cells of a stellate or polyhedral appearance, generally showing condensed fibrous tissue or cartilaginous masses. It is the occurrence of these fibrous elements that has led many pathologists to reject the classification of true myxoma, and they speak of myxomatous modification or degeneration of a connective tissue neoplasm. Such differentiation is quite proper and scientifically accurate, but only where this fibrous or cartilaginous constituent is demonstrable. The accompanying sections show that no such element is present in the cases reported, as the capsule is the only fibrous appearance there, and it does not send in any trabeculae. Unfortunately only one of the cases furnished sections for photographing, as the patient destroyed the neoplasm after examination, but before the pictures could be made. It was identical in structure with the other, however.

Case 1. R. G., aet. 12, healthy girl, daughter of healthy parents, had felt some difficulty in nasal respiration for about two months, and was sure she had never had such difficulty before that time. There was nothing abnormal in the nose, mouth or hypopharynx, but on drawing forward the soft palate, there was seen plainly resting upon it, a smooth, grayish tumor, freely movable. Under ether, digital examination showed it to be attached firmly by a broad base to the basilar process, whence it resisted removal by all the usual instruments, unless I was to be content to remove it in part. Finally, a soft rubber catheter was passed into each nostril, the two ends drawn snugly anteriorly and clamped at the nasolabial margin. Thus the growth was straddled and isolated for manipulation and the palate drawn forward all at the same time,

while the field was absolutely clear of instruments and the hands of any assistant. A large adenoid curette was fitted into the space between the catheters, held firmly there, the back against the



vomer, till the vault was reached, when a sweeping posterior movement removed the mass *in toto*. It proved to be nearly round, and an inch and three-quarters in diameter. It was a pure myxoma, which is especially remarkable as the patient was at the age when such neoplasms are prone to fibrous change, even malignant trans-

formation; yet there was no such manifestation. While it does not prove that no recurrence will take place, it is well to state that none has as yet occurred after an interval of 10 months.

Case 2. M. F., aet. 19, pale, neurotic girl, thought it a year since she first noticed a stoppage of the nose and an irritative cough. Her lungs were normal, and there was no syphilitic or tubercular history to be obtained. While two growths were afterwards found at operation, only one at this time was visible with the mirror, but this was easily seen. The inferior extremity, only on attempted nasal inspiration, rested on the soft palate. She declined to have any operation without a general anaesthetic,

which was accordingly given, and two tumors made out by digital examination, one attached to the basilar process, smaller of the two, heart-shaped, approximately one inch in each direction; the other, clearly felt as if attached to the posterior ethmoid region on the left, 2½ inches long, ¾ inch broad. Both were divulsed with a large pair of adenoid forceps, apparently without leaving any remains. Apart from the fact of the two tumors being excellent specimens of true myxomata, additional interest is lent to the absence of any fibrous structure by the history of another growth, described by the patient as identical, which was removed 11 years before. That she should have had no recurrence of some tumor showing a connective tissue origin, and that the two which did

return, for they must have been recurrences, likewise showed a pure myxomatous structure is, I think, worthy of record, especially, as remarked of the previous case, because the tumor formation covered a period in which tissue change is usually marked, that of puberty and early adolescence. It is too early to make any prediction as to recurrence, inasmuch as the removal was accomplished only 5 months ago.

Discussion.

Dr. Harmon Smith, New York City: This case of Dr. Dabney's must be the exception which proves the rule, for it has been definitely stated by many histologists of national renown that true myxomata do not spring from this region. In the majority of instances myxomata spring from the region of the ethmoid, while myxo-fibromata and true fibromata spring from the naso-pharynx. So far as I know there has been no other case of true myxoma arising from the region mentioned in Dr. Dabney's paper.

Dr. James E. Logan, Kansas City: I would like to ask the nationality of these patients, especially the one with the very large growth. It often happens that these growths appear in individuals of certain nationalities. Those of Scandinavian birth are more apt to have them than any other class of patients. I have had two pathologists at variance on two cases, one operated by myself and the other by Dr. Fenger. One pathologist said there was every evidence of myxoma, the other, that it was fibroid or myxo-fibroma. The tumor in one case, a boy of Swedish nationality, was attached to the basilar process.

Dr. Dabney, closing the discussion: One patient was German, the other American. What Dr. Smith says about the origin of these growths is the excuse for this report. They are supposed never to occur in the region given. I had the specimens examined by skilled pathologists in Washington, at Howard University—a school for colored students, but having very excellent pathologists—and also at the Army Medical school. They are true myxoma. I have looked up the literature, and I could find no other case reported of true myxoma of the rhino-pharynx.

HISTORY OF A TUMOR OF THE PHARYNX EVENTUALLY TERMINATING IN SARCOMA.

BY RALPH BUTLER, M.D.

Mrs. E. S., aged 21 years, native of Pennsylvania, was referred to me by Dr. Henry J. Bartle of Philadelphia, to whom I am indebted for the earlier notes on the case.

He had first seen her in June, 1912, at which time she gave a history of repeated attacks of tonsillitis, for which her tonsils had been removed three years previously, but she was still having "sore throat." Dr. Bartle's first examination showed a subacute nasopharyngitis. Three months later (September, 1912) she consulted him on account of nasal obstruction and a thick purulent discharge for which she had been treated all summer. He suspected syphilitic rhinitis and ordered ¼ to ½ grain of protiodid of mercury three times a day, which was continued for two weeks. There was nothing in the history to suggest lues except the patient's statement that her mother had had some obscure affection of the skin. At this time the patient was well nourished and showed no symptoms of cachexia.

After an interval of several months (May 5th, 1913) I saw the patient with Dr. Bartle, and at that time there was a hard, dark red, umbilicated tumor, resembling a small cervix-uteri, on the posterior pillar of the right tonsil, and a hard mass covered with thick yellow secretion occupying the right choana and obstructing the Eustachian tube. The pulse and temperature were normal. Although protiodid of mercury was started at once, the swelling increased, the uvula becoming red, boggy and pushed forward and the tissues at the angle of the jaw were indurated. The protiodid was increased to ½ grain every three hours and two drams per day of mercurial ointment were added. In one month the swelling had disappeared and the nasal respiration was free. Then the mercury was reduced to one dram of the ointment and 1½ grains of protiodid daily, and tonics were started. Notwithstanding the continuance of the mercury, a slight recurrence was noted within two weeks (June 17th, 1913) in the form of a small pink nodule on the posterior aspect of the base of the uvula which within another week had extended to the posterior end of the nasal septum, the nasal floor and the posterior end of the right inferior turbinal. Iodid of potassium was added and rapidly increased to 170 grains three times a day, and the dose of mercurial ointment doubled. The Wassermann reaction

was delayed negative. Examination of the eyes by Dr. Peter showed bilateral venous engorgement but no evidence of syphilis.

As the patient did not respond promptly this time to the therapeutic test for syphilis we felt more strongly that we were dealing with a sarcoma and therefore Dr. John Deaver was asked to see the case in consultation and he thought it was inoperable. Unfortunately a section of the tumor was not made at this time.

During the next six months she was under Dr. Bartle's care. He reports that three doses of neosalvarsan were given, followed by marked sloughing of the growth and some reduction of the nasal obstruction, so that she could breathe through the right nostril, but by the 9th of September the throat was almost completely filled again by a hard mass involving the soft palate and the left posterior pharyngeal wall. Mercury and iodid of potassium in massive doses were given again. She became salivated and developed trismus, stupor, exophthalmos, dachryocystitis and submaxillary adenitis on the right side and by the 26th of October, 1913, death was expected. Five days later she was able to open her mouth sufficiently for examination and her physician was surprised to find that the inflammation, tumefaction and likewise the uvula had disappeared leaving a mass of scar tissue. Her general condition improved rapidly so that she was able to eat Thanksgiving dinner with her family.

Early in December, 1913, the left nostril and Eustachian tube were completely blocked by a swelling in the nasopharynx which rapidly disappeared while under chlorate of potassium.

She continued well until January 30th, 1914, when a tumor the size of a lima bean appeared on the right side of the nasopharynx. She did not report regularly during the next four months, but claimed that she took 120 grains of iodid of potassium three times daily and inunctions of mercury regularly until three weeks before admission to the German Hospital Dispensary on the 29th of May, 1914.

At this time there was a sloughing mass as large as a hen's egg in the right side of the soft palate above and behind the tonsillar region. Her urine contained a faint trace of albumin. A half dose of neosalvarsan was given in addition to mercury and iodides with slight improvement of the local condition, but she became weak and dyspnoeic and was admitted to the ward after three weeks of the dispensary treatment. X-ray treatment was then added and continued tri-weekly until one month before death. On month after admission (July 17th, 1914) the mass had sloughed away and she seemed to be so nearly cured that she was referred back to the out-patient department, where the treatment was continued with the addition of Fowler's solution. With-

in three weeks the growth had recurred on the left side of the pharynx.

A microscopic section was reported as follows: "The tissue presents all the evidence of chronic infection, being infiltrated with lymphocytes, plasma cells and fibrous hyperplasia. There is no caseation. Moderate endarteritis and arteriosclerosis are present. The appearance suggests syphilis, but is not conclusive. The attempt to stain with the Levaditi method for the presence of spirochetes was not successful." Two months later a second section was examined microscopically and this showed that it was probably a sarcoma.

September 4th, 1914, she was re-admitted to the house because of weakness, dysphagia and some dyspnoea and showed three confluent swellings involving both sides of the soft palate and the right side of the base of the tongue. These were firm, light red, and granular and did not bleed readily. The luetin test was strongly positive and the condition slowly improved under moderate doses of iodid of potassium, seven doses of neosalvarsan intravenously, with daily X-ray treatment for a month. At the end of two months the mass had nearly disappeared, the patient talked well, ate solid food and her general condition was good.

On the 16th of December, 1914, she was shown at the meeting of the Section on Otology and Laryngology of the College of Physicians of Philadelphia, apparently cured for the fourth time. The palate was partly destroyed, scarred and adherent to the posterior pharyngeal wall. The larynx so far as it could be seen, was normal, but there was some induration on the right side pushing it to the left. The voice was quite good and there was no dysphagia. Some of the laryngologists who saw her at that time regarded it as a case of lues and that the diagnosis of sarcoma was probably a mistake.

Mercury and iodid of potassium were continued and she was allowed to go to Atlantic City on January 9th, 1915. Her general health became very good. On February 5th, 1915, she made a visit to the hospital and looked especially well. She was able to breathe and swallow normally and there was apparently no recurrence in the pharynx. She received .6 grams of salvarsan intravenously and returned to Atlantic City the following day.

Two days later her neck and throat began to swell and she became dyspnoeic. This continued until she was readmitted to the hospital on the 11th of February, at which time there was a good deal of infiltration to the right of the larynx and some swelling and redness of the epiglottis. Two days later she died suddenly without cyanosis or marked dyspnoea. Tracheotomy

was considered but did not seem to be indicated and the immediate cause of death was uncertain.

Post Mortem Examination by Dr. J. D. B. Pfeiffer.

The body was that of a young woman, normally developed, of good bony skeleton and fairly nourished. Pupils dilated and equal.

Examination of the thoracic and abdominal viscera revealed both grossly and microscopically only minor abnormalities of no especial moment.

The tongue, oesophagus, larynx, trachea, and surrounding tissues were removed subcutaneously "en bloc." The lymph-nodes on the right side of the neck show considerable enlargement varying up to 1 cm. in diameter. The nodes on the left side were not appreciably enlarged. At the base of the tongue, and just to the right of and anterior to the epiglottis, there is a craterlike ulceration with a sloughing, dark colored base measuring about three cm. in diameter. The edge is not abrupt nor are the tissues markedly indurated. Section through the base of ulcerated area shows it to consist of a grayish, homogenous, translucent tissue, which in some areas seems fairly well encapsulated and distinct from the surrounding tissues; anteriorily however it has invaded the base of the tongue and reached the floor of the mouth, infiltrating also the mylo-hyoid and genio-hyoid muscles. Posteriorly the growth has caused marked distortion of the epiglottis and right margin of the glottis, compressing both laterally and reducing the opening to a narrow antero posterior slit. There is no indication at this time of edema or acute congestion but the mechanical condition present suggests strongly the liability of interference with respiration. Microscopically; the growth consists of small round cells with relatively large nucleus and but little protoplasm. The stroma is scanty and consists of the nutrient vessels and capillaries. It is not, however, highly vascularized. Section through the posterior margin of the ulcer shows a rather dense fibrous capsule which is not sharply defined; section through the tongue however reveals no capsule and no attempt at encapsultation, but the cells of the growth are wandering freely between the muscle bundles and fibres which are seen in all stages of atrophy in the older portions of the growth. There is no evi-

dence of tuberculosis, syphilis or other specific granulomatous process. Sections prepared by the Levaditi method failed to show the treponema. I would regard this growth as a sarcoma of low malignancy, exhibiting both expansion and infiltrating characters.

The question of metastasis is difficult to settle, the cells of the growth resembling very closely those seen in chronic inflammation while the regional nodes are in a hyperplastic condition as the result of the ulceration process, certainly in some areas the character of the cells warrants the belief that metastasis through the nodes has occurred.

Summary: A healthy young woman developed a series of pharyngeal tumors which were apparently cured four times in the course of two years. The first tumor mass yielded to inunctions and protiodid of mercury. An almost fatal attack was relieved by iodid of potassium, mercury and neosalvarsan. In two other recurrences, the X-ray treatment was used in addition to the mercury, iodid of potassium and neosalvarsan. There was no cachexia to indicate malignancy, the patient never losing more weight than could be accounted for by the temporary inability to take food. In the early history of the case the Wasserman reactions were reported to be weakly positive, or doubtful, but later they were always negative. The question that confronts us is, was this a sarcoma from the outset, or was it originally syphilis. As evidence in favor of lues, we have (a) response to antispyhilitic treatment, (b) the histological report on the first section, that its appearance suggested syphilis, (c) there was at least one weakly positive Wassermann and her husband gave a positive reaction, (d) syphilis is often a predisposing factor in the causation of sarcoma, (e) absence of cachexia of malignancy, (f) the luetin test was positive.

In favor of its being sarcoma from the first, we have (a) considerable evidence to substantiate the claim that sarcoma may disappear spontaneously and (b) that it may yield at least temporarily to mercury, iodid of potassium and especially to arsenic.

Dr. J. W. Gleitsmann (1) contributes a paper on the spontaneous disappearance of malignant growths in which he cites a number of interesting cases and quotes Dr. Jonathan Wright as saying

that: "There is no doubt that cases of carcinoma have existed which up to a certain period of their growth not only showed the typical clinical picture, but which also were diagnosed as such by expert microscopists. Nevertheless, the growth disappeared either without any or without a radical operation, and the patient remained permanently in perfect health. In such cases the clinician or surgeon may possibly doubt his own diagnosis, but is rather more inclined to believe in an error made by the microscopist."

This doubtless holds with sarcomata as well as with carcinomata, for as Sir Jonathan Hutchinson states, "Sarcomata and carcinomata are identical manifesttions in different structures."

Carrel & Burrows (2) found the plasma of a sarcomatous animal acquires the property of inhibiting the growth of a sarcoma taken from another animal.

G. Monroe Smith (3) reports a case of multiple round-cell sarcomata in which two of the early tumors disappeared spontaneously.

In 1893 Heinrich Mehler (4) reported a case of round-cell sarcoma in which the original tumors disappeared under iodid of potassium although the patient dies some months later from a melanosarcoma. He stated that Billroth claimed that iodine inunctions with iodine internally could cause the shrinkage of large sarcomata and that Esmarch in 1872 reported a case of small cell sarcoma which improved under iodid of potassium and a case of medullary sarcoma which was healed with the same medicine.

Forbes Ross (5) (1912) maintained that potassium salts prevent malignant disease. He claimed that in Fowler's solution we have the advantage of the potassium, which makes it the most valuable of the arsenical preparations in the treatment of malignant growths. At one time the subject of this paper improved under chlorate of potassium.

We find many statements in literature to the effect that mercury has been used and regarded with favor by various authors, but there is little to substantiate their claims.

The literature on the internal use of arsenic in malignant disease is voluminous and dates back to antiquity. Plinius (6)

strongly recommended its use and Lefebure (1775) (6) claimed 200 cures.

Billroth (7) reported good results from the use of Fowler's solution in inoperable cases, while Tholen (8) claimed a complete cure of a case of lympho-sarcoma, and Kobner (9) cured a spindle-cell sarcoma with the same remedy.

Blumenthal (10) reports extensive experimentation with the use of atoxyl and arsenious acid in inoperable cases securing encouraging results, while Sick (11), Hollander and Pecsi (12) cured sarcoma with atoxyl.

In 1912 Lautenslager (13) reported a case of pharyngeal tumor, which did not improve under iodid of potassium although the Wassermann reaction was strongly positive, but almost disappeared after three doses of salvarsan. The tumor recurred at its original site in the tonsillar region and proved on microscopic examination to be a sarcoma.

John B. Murphy (14) says: "In the last fifty years types of tumors, usually sarcomatous in origin, have been cured with arsenic here and there. No one has learned yet which type of sarcoma it is."

Bibliography.

1. Gleitsmann, J. W., M.D. Remarks on the Spontaneous Disappearance of Malignant Growths. New York Medical Record No. 79, 1911.1.
2. Carrel and Burrows. Jour. A. M. A. 1911. 1. 56. P. 32.
3. Smith, G. Monroe Bristol Med Chir. Jour. XVIII. 1900
4. Mehler, Heinrich, Jodkali gegen Sarkom. I. D. Erlanger. 1893.
5. Ross, F. W. Forbes, M.D. Edinb. Cancer, The Problem of Its Genesis and Treatment.
6. Die Lehre von der Krebskranheit. Zweite Abteilung. Vol. III. S. 60, Wolff.
7. Weiner Med. Wochenschr. 1871. Nr. 44.
8. Tholen, Dr. Friedrich. Ueber die Behandlung der malignen Lymphosarcome mit Arsenik. Archiv. f. Klinische Chirurgie. Bd. 17, 1874.
9. Kobner, H. Berliner Klin. Wochenschr. 1883. Nr. 2. S. 21.
10. Blumenthal, F. Innere Behandlung und Fürsorge bei Krebskranken. Zeitschrift für Krebsforschung. Nr. 10. 1910-11. S. 139-143.

11. Sick, C.C. Med. Klinik 1907. S. 219 Hamburg. Arztl. verein 22 Jan. 1907.
12. Hugo Hollander and Daniel Pecsi. Wiener Med. Wochenschr. 1907. Nr. 11; 1909. Nr. 4-5.
13. Lautenslager, E. Archiv. f. Laryngologie and Rhinologie, 26, 1912. S. 421.
14. Murphy, John B. Murphy's Surgical Clinics. Vol. I, No. 2. April, 1912, p. 209.

Discussion.

Dr. George L. Richards, Fall River, Mass.: A certain number of sarcomas of the upper air tract seem to spontaneously disappear, or to be influenced by remedies which it is hard to think would have any curative effect. I recall a case of sarcoma of the right upper jaw, in a woman fifty to fifty-five years of age, a boarding-house keeper. The diagnosis of sarcoma of the antrum was made by several laryngologists of ability, and this was confirmed by a good general surgeon. She was being treated with Coley's fluid without improvement when she fell into the hands of a Christian Science healer, and the tumor, after or during which time, is said to have disappeared. I have tried to get the opportunity of examining her again, but she is still under the control of the Christian Science healer, who will not allow an examination.

Dr. G. Hudson Makuen, Philadelphia: I had the privilege of seeing the patient mentioned by Dr. Butler, and I think no one who was present at the meeting thought of the probability of a return of the trouble. She had nothing unusual in the pharynx except the scar tissue and the cicatricial contractions which have been described. Her breathing and articulation were fairly good, and it was a surprise to us all when Dr. Butler reported her death at the following meeting.

Dr. George A. Leland, Boston: In re certain cases of sarcomata, which for various reasons are inoperable, I want to emphasize the use of Coley's Mixed Toxins. I have in a number of cases seen them do most excellent work and would like to briefly cite a case which I saw last winter. I was called on the 23d of October, 1914, to go 200 miles up into New Hampshire.

There I found an old lady of 68 frosty winters who consulted first her family physician, Dr. H. M. Wiggin, on March 19, because of some enlargement of her cervical glands. He did not see her again until the 14th of June and advised a consultant, but not until October did she consult her physician for the third time. Then he found that her weight was reduced from 125 to 75 or 80 pounds. The glands were very much increased in size and swallowing was impossible except for a few drops of liquid food. She was markedly aphonic, and of course much weakened, though not confined to her bed. Examination showed many large glands on the right side of her neck under the jaw and a few small ones extending down to the clavicle, and one or two in the right axilla and both epitrochlears; much less on the left side under the jaw. Those on the right side extending around to the median line posteriorly. The tonsils were moderately enlarged, hard, red, shiny and lobulated. With the laryngoscope and finger the pharynx below the level of the tongue was seen to be much obstructed by two tumors on the right side and one on the left which fitted into the angle between the other two, so that liquid food only had a narrow zig-zag passage downward. Considering the case inoperable, I advised the doctor to excise a gland from behind her right ear, which he did and sent it to Dr. Kingsford, Pathologist at Dartmouth Medical School, and to Mary Hitchcock Memorial Hospital, and also for the State of New Hampshire, who made a diagnosis of lympho-sarcoma, commonly known as Hodgkin's Disease. Dr. Wiggin wrote me under date of May 26th that after giving in all, from November 14th at irregular intervals until May 6th, sixty-nine injections there was great and continuous improvement after the first reaction. The lady then weighed one hundred and two pounds, is able to be about and do her own work, is in fine condition and her friends would scarcely know she had been ill. The tumors have disappeared; swallowing is unobstructed.

I intend to write up this case more fully, but thought it would be well to cite it briefly here in this connection. I understand from our expert in serum therapy, Dr. Sanborn, that it is not usual to treat Hodgkin's Disease in this manner. And Dr. Coley

said in 1911 in a "Report of Recent Cases of Inoperable Sarcoma Successfully Treated with Mixed Toxins of Erysipelas and B. Prodigiosus" (Surg., Gyn. and Obstet., xiii, pp. 174-190), "Mixed toxine have been used in a very small number of cases with marked inhibitory action in several and complete disappearance in two" (one 19 and one 24 years of age). This leads him to believe that this disease is a type of sarcoma. At any rate, it seems to be one more triumph for Dr. Coley's wonderful toxins—wonderful in conception and wonderful in results.

Dr. Harmon Smith, New York City: We should not depreciate the benefits of Coley's fluid. I recall a case of sarcoma of the antrum, occupying the entire nasal cavity and projecting outward. There was lymphatic involvement, and the case seemed hopeless. It was pronounced sarcoma by the pathologists. I said the only thing we could do was to operate, and that if he died on the table it would be the most satisfactory termination of the case. The patient went to the General Memorial Hospital, was put under treatment with Coley's fluid, and the sarcoma entirely disappeared.

Dr. Henry L. Swain, New Haven, Conn: Whether the disappearance of these tumors is due to tissue transformation, as has been suggested, or to the agents employed, the fact is that we stand with reference to them in the position of strict empiricism. This applies to Coley's fluid as much as to anything else. If we could collect all the observations on the latter subject we might then have something to go by; until that is done its use will always be empirical. I have two cases in which it seemed to do good, and many others in which it accomplished nothing.

NASAL DEFORMITY AS A CAUSE OF NASAL OBSTRUCTION CORRECTED BY THE SUBCUTANEOUS METHOD.

BY JOHN O. ROE, M.D.

Leaving out of consideration those deformities, due to disease, such as lues, lupus, growths, etc., deformities of the nose may result from three principal causes, as, heredity, abnormal development and traumatism.

Those of congenital or developmental origin may be confined to the nose and septum alone, unassociated with deformities of other parts, or they may be associated with general distortion of the whole face, including the jaws and hard palate. In some cases it is difficult to determine if the asymetry of these parts has been congenital or if it has been developmental as the result of mouth breathing occasioned by large tonsils and adenoids when the two are associated together, as is often the case. Such deformities also may be confined to a limited part or there may be a distortion of the whole nose due to unequal development of the two sides. The septum is also found distorted from unequal development of the two plates composing it.

In the primitive races that resort to the moulding of the head as a mark of beauty, we find a much larger proportion of facial asymetry and distortions of the nose and septum than among those in the natural state. Also, among the mixed races such deformities are the most prevalent, owing to the peculiarities of inheritance.

In excessive development of the nose which sometimes amounts to gigantism there is generally a high arch palate and often a marked deflection of the nose toward the side of the least development.

In defective development the deformity may vary in degree from that confined to a limited area to an entire absence of the nose.

Defective development of the osseous portion is quite commonly associated with an excessive development of the turbinals

and of the ethmoid cells, thereby causing marked nasal obstruction and much intra-nasal pressure, which the writer believes in many cases, to have had much to do with the defective development of the nose. In these cases there is usually associated an excessive development of the cartilaginous portion, giving the end of the nose a bulbous or pug-nose appearance. This redundant tissue is usually quite vascular, and the vessels often markedly distended due to the disturbance of the circulation by the sympathetic irritation reflected from the intra-nasal pressure.

Imperfect development of the anterior or cartilaginous portion of the nose is usually associated with more or less collapse of the alae which is accentuated by the inspiratory suction force or so-called "negative pressure" that results from lack of sufficient breath way for the inspiratory current. When this condition is associated with unequal development of the two sides, the nose becomes distorted or twisted with a marked bending of the cartilaginous and osseocartilaginous portion of the septum toward the opposite side, the curve thereby more or less obstructing both nasal passages.

In defective development of the nasal passages there is often an over development of the nasal process of the superior maxilla, encroaching upon and thereby causing a marked stenoses of the passage.

Nasal deformities of traumatic origin are confined mainly to the anterior portion of the nose owing to its exposed position. This is quite true in the case of minor as well as major accidents as in the case of children falling on the nose, dislocating the triangular cartilage and distorting the septum and sometimes also the nasal walls. In many of these cases the actual cause of the injury remains unknown for the reason that as soon as the child stops crying and the nose stops bleeding no further attention is paid to it.

One of the minor causes of deflections or distortions of the nose which, with propriety, may be classed under the head of traumatism, is the frequent and forcible compression of one side of the nose during the act of blowing it in order to force discharges from the opposite, usually the free side. In this way, after a time the outer wall on that side becomes forced inward, the

septum and the entire lower end of the nose distorted toward the opposite side, the anterior nares obstructed and the whole lower portion of the nose markedly deformed. In many cases, however, the forcing inward or collapsing of the lateral walls of the nose with the resultant narrowing of the passage may be bilateral from the repeated squeezing of the nose that many indulge in when using their handkerchief.

Another frequent obstruction to the nasal orifice is a dislocation and an enchondroma at the point of attachment of the septal cartilage to the anterior nasal spine, and also along the line of articulation of the cartilage to the maxilla.

In the correction of the nasal deformities with which nasal stenoses are associated it "goes without the saying" that the stenoses should first be removed or corrected and all intra-nasal disease or growths or other obstructions given the necessary attention to provide free nasal respiration before the correction of the external deformity is undertaken. In some cases, however, where the nasal deformity is the cause of the stenosis the two must necessarily be corrected together. This is particularly true of deformities of the lower end of the nose, which may comprise at one time dislocation of the triangular cartilage collapse of the alae, displacement inward of the wall on one or both sides by external violence, or of congenital narrowing of the passages from abnormal development.

In the treatment of the nasal stenoses found associated with nasal deformities, I shall not discuss those ordinary conditions that are found obstructing the passages confined to the septum or turbinated bodies, for these conditions are so common that they are dealt with during ordinary intranasal operations. I wish, however, to call special attention to a new operation or method by which the stenoses or obstruction of the passage due to the encroachment of the maxillary wall is dealt with according to the writer's subcutaneous method. This operation, which consists mainly in a resection of a portion of the nasal wall of the maxilla, is performed as follows: A vertical incision is first made from the vestibule of the nose down to the nasal process of the maxilla. The periosteum is then raised from both the internal and the external surfaces so as to freely expose the bone preparatory

to the operation. If the conditions of the nose are such that it is not feasible to enter through the vestibule the entrance can readily be made under the lip. A straight, narrow, flat chisel is then inserted with the edge slanting upward and inward so that it is practically on a line with the plane of the outer surface of the maxilla. The chisel is then driven through the nasal process

Fig. 1.
Showing the compressed and distorted condition of the nose resulting from the left nasal wall being driven inward.

at its base as far back as is necessary until the wall of the nose is so freely liberated that it can readily be forced outward upon the upper surface of the maxilla as far as required to replace the wall in its normal position. If the nasal surface of the bone, from where this portion of the bone has been chiseled off, still obstructs

the nasal passage a sufficient amount of this bone should be chiseled off or resected to provide an abundantly free passage. When this has been accomplished and all the debris of the bone removed the soft parts are replaced and the nose firmly packed giving it the amount of distension desired. For this purpose Simpson Bernay Nasal Tampons of the thickness required is the most

Fig. 2.
Showing nose after the wall has been set outward and the deviation of the nose and septum corrected restoring free nasal respiration.

serviceable dressing or packing, used in conjunction with iodoform or bismuth gauze. For the purpose of putting the outer wall in place after it has been chiseled through, particularly if any degree of force is required, a pair of forceps, similar to Adam's forceps, will be found most serviceable. They can be inserted

through the opening that has been made and the liberated bone grasped and put in place without lacerating the soft parts.

By way of illustrating this operation Figs. 1 and 2 are made from photographs of the patient, both before and after the operation. This patient was injured by a fall striking on the left side of the nose, fracturing and driving the maxilary process inward, at the same time fracturing the opposite wall of the nose, driving it outward, thus offsetting the whole lower portion of the nose to the right and almost completely closing both nostrils. The patient when he came to me about eighteen months ago was suffering much discomfort from the obstructed nasal respiration and also much annoyance from the nasal deformity. In this case it was necessary to liberate and reset the nasal process of the maxilla on both sides. On the left side it was necessary to resect it according to the plan of the operation just described. On the right side it was necessary to cut the wall through with a chisel and liberate it so that it could be turned inward in order to replace the nose in the center of the face. The septum also required straightening in order to place it in a medium line and to provide free nasal respiration.

This method of correcting this condition I have found far superior to any other. By making the operation entirely subcutaneously and also submucously so far as related to the interior of the nose we avoid entirely all scarring of the skin and also the destruction of mucous membrane and the resulting cicatricial contractions and nasal obstruction that would follow the correction of this condition by the intra-nasal route.

There is another condition which ofttimes is the cause of much anterior nasal obstruction and irritation, although in no wise related to any nasal deformity still frequently accompanying such conditions. It is a baggy or hyertrophic, oedematous condition of the connective tissue just inside the vestibule. To cut this tissue away and destroy more or less of the surface of the mucous membrane would cause still more narrowing of the passage for being on the concave side of the circle the contraction of the cicatrix on healing would still further constrict the opening. For the correction of this condition I make a submucous resection of all this connective tissue between the submucosa and the

wall of the nose. I then sew this inner wall directly to the outer wall, usually as close to the nasal bone as possible, using fine horsehair sutures passed through from the inside. By tieing the ends over a small piece of gauze no injury whatever to the skin occurs, so that when the sutures are taken out after five or six days scarcely a mark can be seen where the horsehair passed through the skin, and in a very short time no trace can be found. Holding this inner wall against the outer one union between the two may be further assisted by packing the nostril until complete healing has taken place. We then have a beautifully clear nasal opening without having destroyed any of the mucous membrane or leaving any trace of the operation behind.

Stitching of these surfaces together is far superior to packing alone, for it holds the parts so firmly together that they heal in exactly the position in which they are placed. Packing of the nostril is, however, of assistance in maintaining the outward spread of the alae and in maintaining the parts aseptic.

THYROID DISEASE IN ITS RELATION TO LARYNGOLOGY.

BY JOHN E. MACKENTY, M. D.

The object of this paper is to present to you in some of its aspects the close relationship existing between diseases of the thyroid gland and pathological conditions of the throat, nose, larynx and mouth. Of late much scientific thought has been expended upon focal infections in their relation to general diseases letting in a flood of light upon what was hitherto obscure. I have but to cite the recent epoch making discoveries of Rosenow in bacterial infections to show how vastly our outlook upon the etiology of disease must change in the near future. We laryngologists, once occupying so small a place in the field of specialism, now find ourselves standing at the main gateway of disease, and yet but dimly conscious of the enormous responsibility which such a position must entail in the time to come. Statistics tell us that between the ages of sixteen and twenty-four, forty per cent. of the human family gives a history of accessory sinus disease, tonsil and adenoid disease, chronic pharyngitis and tooth infections, all of which are now proved to be possible potent factors for ill in the future life of the individual.

With this widening view and our awakening to the importance of our specialty, like a youth conscious that manhood is upon him, we are reaching out for new fields to conquer. We have extended our confines into the lungs through bronchoscopy and into the cranial cavity by way of the pituitary body. Now I am glad to see that many of us are looking with covetous eyes upon the surgery of the neck, so closely does this attractive field lie upon our ancient boundary lines. But a few years ago how far away the thyroid gland and its pathology seemed to the then laryngologist. Now in the light of new discoveries it ventures across the threshold of one of the most exclusive laryngological societies asking for a place in its deliberations. Is it too much to hope or too rash to predict that the laryngologist of the near

future will go one step further and make the care of the thyroid his own, even unto its surgical treatment if needs be?

Four of the principal ductless glands are developed from the primitive pharynx and, from a histological and functional standpoint, are grouped under two headings: (1) The tonsil and thymus; (2) The anterior lobe of the pituitary and the thyroid. The tonsil and thymus are lymphoid in structure. Their action is along the first line of defense against micro-organisms and their function is the formation of lymphocytes.

The anterior lobe of the pituitary and the thyroid are secretory glands. Their function is that of detoxication and their action is against bacterial toxines, thus placing them on the second line of defense. Viewed from an embryological and functional standpoint these glands must be closely related in their reaction upon one another and upon metabolism in general.

The almost universal presence of tonsillar hyperplasia in the young is, to say the least, suggestive of its physiological relation to development. The belief that the tonsils and the thymus are closely related is strengthened by the facts that tonsillar hyperplasia is in a reverse ratio to thymus regression; that the thymus and tonsil have a common embryonic origin and anatomic structure.

The earliest appearance of lymphoid tissue is in the gill slits of fishes, where it serves the protective function of filtering out the minute particles in the water. This fact gives us the key to the function of the tonsil and lmphoid tissue in general. When this function is overworked, pathological hyperplasia is the result, thus turning the tonsil into a toxic focus. May not this focus make greater demands on the detoxication function of the thymus with the resultant persistence of that gland beyond its appointed time?

THYROIDITIS SECONDARY TO NOSE AND THROAT CONDITIONS

Thyroiditis has been known to follow sinusitis, acute nasopharyngitis, tonsillitis, laryngitis, scarlet fever, typhoid fever, erysipelas, pneumonia, grippe, parotitis and mouth infections.

Primary thyroiditis is mentioned in the literature, but in my opinion it has as much place in pathological nomenclature as idio-

pathic peritonitis had in its day. I believe that thyroiditis is always secondary to infection elsewhere and that the manifestations in the thyroid gland are due to tissue predisposition.

Four classifications may be made:

(1) Acute thyroiditis simplex.

(2) Acute strumitis.

(3) Acute thyroiditis in Graves' Disease.

(4) Suppurative thyroiditis.

Lublinski (1913) considers angina a frequent cause and reports sixteen cases. He believes that it is often overlooked on account of its usual mild nature and because the thyroid is seldom examined. De Quervian observed six cases secondary to angina, one of which had two individual attacks following angina and acute tubal catarrh. In another case of acute inflammation, in a diffuse parenchymatous goiter, the tumor was removed to relieve a threatening dyspnoea.

Robertson (1911) reports five cases. One of these was an acute strumitis. Immediate tracheotomy and artificial respiration saved the patent from asphyxiation. In another case following acute laryngitis the swelling of the gland was so great as to necessitate the division of the thyroid isthmus and tracheotomy. In Tavel's case following acute naso-pharyngitis streptococci were demonstrated in the gland. Two other cases gave a sterile culture.

Gussinbauer relates a case of pyaemia and abscess of the thyroid following coryza.

The avenue of infection is through the bloodstream. As the thyroid veins are valveless, infection may easily enter by this route. When such is the case suppuration is the rule (Berard).

Géza Gāli's case of acute suppurative thyroiditis with acute exopthalmos is interesting. Pure typhoid cultures were recovered from the pus.

Hager (1912) reports eighty-seven cases of acute thyroiditis from all causes, many of which were from focal infection in the nose, throat and teeth.

Voorhees (1914) reports acute thyroiditis following acute lingual tonsillitis.

Theisen (1913) saw six cases of acute thyroiditis following acute tonsillitis.

My own experience in this disease is limited to six cases, all mild excepting two, which deserve special mention.

H. M., female, thirty-four years old, was in a well-advanced stage of Graves' disease when she presented herself with an acute follicular tonsillitis. Five days later severe thyroid inflammation supervened and went on to suppuration. Thyroid opened on both sides—two distinct abscesses were found, considerable haemorrhage, severe reaction, eventual recovery with marked improvement in the Graves' symptoms, due no doubt to extensive destruction of gland tissue.

G. R., aged fourteen, female, had an acute thyroiditis one week after removal of an adenoid. The swelling was moderate and quite out of proportion to the dyspnoea which became so severe that a tracheotomy was done. When the trachea was opened there was no relief of dsypnoea. A large catheter was introduced almost to the bifurcation. An obstruction was met behind the sternum which later proved to be an enlarged thymus. Recovery.

SYMPTOMS OF THYROIDITIS.

1. *Obstruction to respiration* may be due as much to a concomitant swelling of the laryngeal and tracheal mucosa as to thyroid enlargement. This may go on to complete obstruction and require surgical interference.

2. *Nerve involvement.* The great auricular nerve is frequently involved, causing pain radiating to ear and occiput. Rarely recurrent nerve paralysis has been observed. Hoarseness, dry irritative cough and dysphagia are usually present. Aphonia may occur and blood-stained expectoration is not uncommon. Sympathetic nerve disturbances, when present, are of importance, producing ptosis, miosis and diminished perspiration, and may be accompanied by vagus symptoms, viz.: vomiting and retardation of pulse. The febrile reaction and constitutional symptoms vary with the degree of infection. Recovery in from ten to fifteen days is the rule.

RESPIRATORY DISTURBANCES IN GOITER.

Though respiratory disturbances do not play an important part in the symptomatology of goiter they occasionally prove ex-

tremely distressing. Prolonged inspiration and expiration, irregularities in the form and volume of individual respirations may be present with a dry spastic cough. These symptoms intermit with periods of fairly normal breathing and are in many cases independent of tracheal pressure from the enlarged gland. In my opinion transient changes in a concomitant thymic hypertrophy may explain some of these. Toxaemia acting upon the central nervous system or directly upon the pulmonary circulation and musculature of the bronchioles may explain others. Thus we have a picture clinically resembling asthma.

If we wish to get a comprehensive understanding of the subject, we must review briefly the part played by the thymus gland. Matti found in one hundred and thirty-three deaths following thyroidectomy that seventy-six per cent. had the thymus abnormally enlarged. Oswald found it present in all severe cases of exopthalmic goiter. Morel, Moebius and Hart credit the thymus with being the cause of goiter disease. Hausemann admits its frequent presence, but interprets the thymic hypertrophy as a secondary reaction of the lymphoid tissue. Hart in his latest utterance goes so far as to state that the removal of the thymus with the thyroid would obviate the so-called thymus death. Melchive finds thymic hypertrophy present in eighty per cent. of goiter patients and believes that it represents a tissue reaction against hyperthyroidism. My belief is that future observation will distinguish between goiters when the thymus is persistent from birth and goiters where the thymus and thyroid enlarge simultaneously.

PARATHYROGENIC LARYNGISMUS.

This rare condition is a spasm of the laryngeal muscles caused by the tetany toxin so-called. It might better be expressed as a toxic condition due to the absence or suppression of parathyroid secretion. Pineles reports six cases. One such case came under my observation in 1896. It was of such severity that a tracheotomy was necessary to prevent asphyxiation.

LARYNGOPLEGIA.

Under this heading we shall review the pre-operative and post-operative paralyses of the larynx. The recurrent laryngeal nerve

supplies all the intrinsic muscles of the larynx excepting the crico-thyroid, which is inervated by the external branch of the superior laryngeal. This rigid classification is not anatomically correct. The superior nerve may give branches to other muscles than the crico-thyroid. The existence of a middle laryngeal nerve from the pharyngeal branch of the vagus has been demonstrated, giving an extra nerve supply to the crico-thyroid. Then it must not be forgotten that the terminal filaments of these nerves frequently cross the median line, giving a weak supply to the other side. These latter facts are important and at times consoling to the surgeon. The nerve fibers supplying abductor impulses are the most readily affected by pressure.

The paralysis may be of the abductor or adductor type or both (cadaveric cord). In abductor unilateral paralysis the speaking voice may be but slightly changed or even normal. In adductor unilateral paralysis the voice is always hoarse, rough and uncertain. Double adductor paralysis is a rare condition and has been known to produce severe dyspnoea.

Justus Mathews, in his observations on one thousand cases of goiter, notes some degree of laryngoplegia in 206 cases:

Both sides affected	17
Paralysis—right	18
Paralysis—left	30
Paresis—right	50
Paresis—left	83
Tensors affected—right	4
Tensors affected—left	4

The larger the lateral lobes, the greater the tendency towards paralysis. Median lobes caused no motor disturbances. The greater number occurred in enlargements near or beneath the clavicle.

The post-operative paralyses in these one thousand cases gave:

12 Total Paralyses.

22 Partial Paralyses.

The ultimate result in these could not be ascertained as they were not available for observation.

Dumont noted in 1,148 pre-operative cases forty-three cases of vocal cord paralyses varying in degree, six with total paralysis.

All but four were improved by operation. Operative lesions of the recurrent nerve occurred in sixteen cases, with permanent impairment of voice. In seven other cases the nerve or nerves were injured but function was ultimately restored.

Berard analyzed 155 goiter patients, having vocal or respiratory disturbances:

13 Paralyses or paresis of the right cord.
9 Paralyses or paresis of the left cord.
0 Bilateral.
14 Deviations or deformities of the larynx.

In the remaining 121 cases the compression was below the larynx and in the mediastinum, manifesting itself by cough, dyspnoea, asthma, etc.

Mathews' observations as to the predominance of left cord involvement is not upheld by the observers abroad, who find the right cord involvement more frequent. In paralysis from other causes the left nerve is more often affected, due to its longer course, but in the neck the right nerve, being more exposed anatomically, should be more prone to injury from the enlarged thyroid.

Wolfler examined seventy-three goiter patients irrespective of the presence or absence of vocal or respiratory disturbances and found eight cases, some of them presenting paralysis of one vocal cord and others showing functional disturbances of the laryngeal muscles due to displacement of the organ.

My observations on several hundred goiter patients, extending over twenty years, shows a much smaller percentage of laryngoplegias than is given above. No total paralyses were seen. I have records of only 7 cases of unilateral total paralysis, 5 on the right and 2 on the left side. Slight disturbances of the muscular movements of the larynx were frequently observed, such as lack of cord tension, inability to strongly abduct or to adduct the cords. Voice changes were very numerous. Loss of modulation and timbre producing a weak monotonous tone. In singers the loss of tone quality and control of the higher notes was marked. In many the singing voice was ruined. In a few cases a moderate degree of chronic laryngitis was present. It is noteworthy that bilateral paralysis is suggestive of malignant goiter.

In my 258 mixed post-operative cases 3 had total permanent unilateral paralysis, 6 had unilateral paralysis with eventual recovery of motion. One had collapse of the trachea which nearly cost him his life at the time of operation and which since shows considerable narrowing of the tracheal lumen.

That no mortalities occurred in this series is due to several causes:

1. Careful selection of cases, and time of operation.
2. Careful and light anaesthesia.
3. Avoidance of local traumatism by not trying to do the operation in a given number of minutes.
4. The use of liberal drainage.

Relative to recurrent nerve recovery after thyroidectomy where lesion has existed before operation, we should not be too optimistic. The intimate contact of these nerves with the tumor must in many cases profoundly alter their structure, especially if relief is long delayed, but so long as there is not total atrophy of the laryngeal muscles, some hope may be entertained of at least a partial resumption of function. Four of my unilateral laryngoplegia cases underwent operation. Function returned in three. Two years after operation, the fourth case was unimpoved. One of the recovered cases, a singer, never regained the singing voice in its former perfection.

Compression of the recurrent nerves may manifest itself in nerve irritation first, by clonic spastic phenomena, such as dry hacking cough, coming in attacks; second, by clonic intermittent contractions of the vocal cord, causing peculiar voice disturbances; third, by bilateral spasm of the glottis, lasting for days and sometimes terminating in paroxysms of acute asphyxia.

These symptoms may persist until the irritated nerve is completely compressed with a resultant total paralysis. In complete unilateral paralysis the voice is at first markedly impaired, but in a short time it may assume a fairly normal character for ordinary conversation. Voice fatigue, however, may persist for weeks or for good. The impairment is always evident in loud speaking, shouting and singing, the voice tending to break entirely.

COUGH.

A dry, nervous, irritative cough must not be overlooked as a possible initial symptom of goiter. At times it is very troublesome and may be much increased in the recumbent position. Its severity bears no relation to the size of the goiter.

Cough, temperature, rapid pulse, emaciation may simulate tuberculosis. In 129 cases examined by me since 1911, I observed cough in 24.

Dyspnoea and dysphagia are positive indications for operative interference. After thyroidectomy these symptoms are relieved in seventy-five per cent. of the cases. If persistent, an overlooked submerged lobe should be suspected. This possibility accentuates the importance of tracheoscopy to determine all points of pressure. Absorption of the tracheal rings may be observed and malignant disease suspected if the tracheal wall is infiltrated. Dysphagia is temporarily increased by operation, but subsides in a week or two.

Tracheal collapse during operation, which occurred in one of my cases, is a serious complication. In this case anaesthesia by tracheal insufflation was used to complete the operation. The anterior wall of the trachea was then suspended, the wound left partly open and the patient's head fixed in extension by plaster bandages. Acute pneumonia occurred on the third day and pericarditis ten days later. Ultimate recovery. The trachea was still flattened (six months later), with, however, no respiratory embarrassment. Tracheotomy should be avoided in this accident as causative of serious wound infection. Tracheal collapse may occur hours and even days after operation, especially when the patient's head is allowed to drop forward, as in sleep.

That myxoedema may produce laryngeal and pharyngeal symptoms, I would relate the following case:

A. S., male, aged forty-one, came to me complaining of hoarseness and cough for one year, with profuse mucoid expectoration. During sleep he had attacks of asphyxiation, which at times seriously interfered with his rest. Examination showed a pale oedematous mucosa of the mouth, throat, larynx and trachea, with much tenacious mucus in the pharynx and larynx. After con-

siderable treatment with no effect I finally suspected myxoedema and placed him on thyroid therapy. The cure was rapid and complete.

CASE REPORTS.

The following cases are selected from many in my series to show the connection between thyroid disease and infections in the nose, throat and mouth.

1. Mrs. E. S., fifty-two years old, in 1907 developed acute pansinusitis, nature of infection unknown. Two weeks later acute thyroiditis. The thyroid enlargement was extreme and constitutional symptoms severe. Convalescence slow. Two years later the patient consulted me for chronic sinusitis involving all the sinuses on the right side. Characteristic symptoms of myxoedema were present. Thyroid treatment—improvement. Refused operation on sinuses. In this case thyroid atrophy followed the acute infection.

2. Mrs. J. D., aged fifty-four. In 1909 acute nasal infection. Following this there was a gradual enlargement of the thyroid with slight exopthalmos, tachycardia tremor, etc. I saw the patient again in 1911: Unilateral frontal and ethmoidal sinusitis with polypi. The goiter was now small and fibrous in type. Weight in one year increased forty pounds above her usual weight. General weakness, skin dark and coarse, pulse normal. During the past year had several attacks of acute abdominal pain with diarrhoea and febrile reaction, and general acute abdominal tenderness, accompanied by firm elastic swelling on the shoulders, neck and face and anterior surfaces of the legs. Very nervous. Refused sinus operation. Could not take the smallest amount of thyroid. All treatment unavailing by many doctors and in many sanatoria. This is a mixed case, representing a class of which little is known.

3. Six cases were observed in girls between the ages of twelve and eighteen years. The symptoms may be grouped as follows: soft, uniform, slight enlargement of the thyroid; a moderate secondary anaemia; nervousness; pulse rate increased; loss of weight, gastro-intestinal disturbances. In all some change was found in the lymphatic ring of the throat; enlarged tonsils, naso-

pharyngeal or lingual adenoid. Treatment of this lymphatic ring, with iron internally, cured all but one. She is now under observation showing a gradually increasing Graves' complex.

A. K., aged thirty, married, came under observation one year ago with advanced Riggs' disease. Every tooth in her head was affected. Two months later she consulted me again for a chronic sore throat. Both tonsils were riddled by small pus pockets and abscess cavities. The condition of the mouth and throat was exceedingly foul. Culture of the tonsil showed streptococcus capsulatus. Operation to remove tonsils was agreed upon, but the patient did not again appear till one month ago. She had then the most fulminating case of exopthalmic goiter I have ever seen. The symptoms dated back but two months. Eyes were protruding with large soft goiter present. Pulse 140, tremor and rapid emaciation. Tonsils were removed and teeth are under treatment. No improvement to date.

C. G., girl aged twelve, consulted me in September, 1914. Tonsils partly removed in 1906. Small portion of upper poles left. Stumps unhealthy looking, though causing no discomfort. Child was healthy but abnormally nervous. Perceptible enlargement of the thyroid gland. In February, 1915, acute streptococcus viridens, tonsillitis. Swelling of glands in neck. Two weeks after subsidence of these symptoms she developed slight fever and muscular and joint pains. Extreme degree of tachycardia, great increase in thyroid enlargement. The condition was evidently a generalized streptococcus viridens infection. Recovery slow. The thyroid is larger than it was before the acute infection and she is showing increasing signs of Graves' syndrome.

BACTERIOLOGY.

Gilbride cultured fourteen cases of mixed goiters and found positive growths in two.

(1) Exopthalmic goiter gave micrococcus tetrogens.

(2) Cystic goiter gave streptococcus vermiformus of Sternberg.

Rosenow found diphtheroid bacilli in several exopthalmic goiters. From many other sources bacterial findings in goiters are now coming in.

In conclusion, I would say that the evidence fast accumulating, points to goiter as a condition of secondary reaction to bacteria, their toxins or to some chemical poison of faulty metabolism.

The direct connection between throat, nose and mouth infections and acute thyroiditis is established beyond argument. That there is a physiological reaction in the thyroid to all infections is also well proven. It is but a step further to the suspicion that chronic thyroiditis (i. e., Graves' and Struma) may be the natural consequence of repeated reactions and over activity in the thyroid gland. Such a hypothesis is not untenable when we realize how often nature overdoes herself in salutory efforts, thus changing a physiological process into a pathological one.

Bayer—Zur Histologies der Basedow. Thymus. Beiträge zur Klin. Chir., Vol. 28, 1912, p. 408.

Beebe—The Relation of Pathological Conditions in the Nose and Throat to the Origin and Treatment of Hyperthyroidism. Jrl. Am. Med. Assn. August 29, 1914, p. 769.

Berard—Functional Results and Comparative Indications of the Various Operative Procedures in Thyroid Enlargements. Noveau Traite de Chirurgie, Vol XX, 1908, p. 224.

Billings—Mouth Infection as a Source of Systemic Disease. Jrl. Am. Med. Assn. December 5, 1914, p. 2024.

Bistritzky—Veränderung der Schilddrüse nach Extirpation des Galglion Sympathici cervicale infimum. Dissertation, Bern, 1913. International Centralblatt für Laryngol, Vol. 30, 1914, p. 377.

Bonny—A Case of Acute Inflammation of the Thyroid Gland. The Lancet, June 15, 1911.

Buhl—Hyxoedem mit Primasymptomen in den oberen Luftwegen. Transactions Danish Oto-Laryngol. Soc., March, 1912. Monatschrift F. Ohrenheilkd, Vol 47, 1913.

Capelle & Bayer—Thymus und Schilddrüse in ihren wechselseitigen Beziehungen zum Morbus Basedowii. Beiträge zur Klin. Chir., Vol. 86, 1914, p. 509.

Chesuais—Thyroidities a bacillus d'Ebert. These de Paris, 1902.

Colzi—Strumite acuta suppurativa post-typhum. La Iperimentale, 1891.

Davidson—Thirty-three Cases of Thyroid Disease. Medical Record, No. 25, 1913, p. 1113.

Dornis—Kehlkopfpfeifen beim Pferde infolge Vergröserung der Schilddrüse. Archiv. f. Wissenschaft in prakt. Tierheilkunde, Vol. 40, 1913, p. 184.

Dumont—Rekurrensläsionen bei Struma. Deutsche Zeitschrift. f. Chirurgie, Vol 104, 1910, p. 386.

Dupraz—Thyroidite consicutive a la févre typhoide et causee par le bacille d'Eberth. Archives de Med. Experim., 1892, p. 76.

Farrant—Throid Action and Reaction. Proceedings Royal Soc. Medicine. Pathological Section. Vol. VI, No. 1, 1912, p. 21.

Fontanier—Thyroidite aigue grippale. These de Paris. 1909-10.

Geza Gali—Strumitis post typhost apostematosa tarda und sekundäre Basedowsche Kronkheit. Deutsche Med. Wochenschrift, No. 27, 1913, p. 1302.

Gilbride—Cultures from Thyroid in Goitre. Jrl. Am. Med. Ass'n, No. 25, 1911, p. 1988.

Gilmer—A study of the Bacteriology of the Alveolar Abscess and Infected Root Canals. Jrl. Am. Med. Ass'n, Dec. 5, 1914.

Goldberger—Zwei Fälle von primärer Thyroiditis acuta simplex. Wiener Med. Wochenschrift, No. 32, p. 1879.

Grünwald—Die Krankheiten der Mundhöhle, des Rachens und der Nase.

Haberer—Weitere Erfahrungen uber Thymus Reduktion bei Basedow und Struma. Archiv. f. Klin. Chirurgie. Vol. 105, 1914, p. 296.

Hagen—Die akute, nicht eiterige Thyroiditis. Die bakterielle Thyroiditis. Centralblatt f. d. Grenzgeb. d. Med. u. Chir. XV, 1912, No. 2, p. 41.

Hofstaetter—Die Anwendung der Hypophysen Substanzen in der inneren Medizin und Gynaekologie. Mitteilungen der Gesellschaft f. d. ges. Therapie. II Jahrgang. Heft 1914, p. 15.

Hart—Bedeutung der Thymus für Entstehung und Verlauf des Morbus Basedowii. Archiv. für Klin. Chir., Vol. 104, 1914, p. 343.

Illoway—A Case of Acute Thyroiditis of Rheumatic Origin. Am. Otol. Rhinol. Laryngol. Ass'n. 1900.

Jackson—Thymic Tracheostenosis. Thymectomy. Cure. Prl. Am. Med. Ass'n. May 25, 1907, p. 1753.

Josefson—Hutchinson's Zähne als Ausdruck der Insufficienz der Schilddrüse. Dermatol. Wochenshrift, No. 19, 1914.

Kocker—Discussion on the Surgical Treatment of Graves Disease. British Medical Journal, October 1, 1910.

Kummel and Travel—Strumite typhique. Revue de Chirurgie, June, 1891, p. 507.

Kvitintzky—Thyroidite typhique; sa nature Eberthienne. Tése de Montpellier, 1907.

Lublinski—Die akute, nicht eiterige Thyroiditis. Berliner Klin. Wochenschrift, No. 18, 1914, p. 834.

Lublinski—Thyroiditis acuta. Ueber die Komplikation der Angina mit akuter Thyroiditis. Wiener Med. Wochenschrift, No. 42, 1910, p. 2498.

Lzmurlo—Presentation of Patient. Laryngo-Otiatric Section of XI Polish Congress. Kraken, July, 1911. Ref. Monatschrift für Ohrenheilkunde, Vol. 47, 1913, p. 816.

Mathews—Observations on the Vocal Cords in 1000 Cases of Goitre. Jrl. Am. Med. Ass'n, Sept. 3, 1910.

Matti—Ueber die Combinations von Morbus Basedowii mit Tymushyperplasie. Deutsche Zeitschrift f. Chirurgie, Vol. 116, 1912, p. 425.

Mayo—Mortality and Late Results from Thyroidectomy in Exopthalmic Goitre or Hyperthyroidism. Trans. Am. Laryngol. Ass'n, XXVI, 1908, p. 597.

Mayo—Mouth Infection as a Source of Systemic Disease. Jrl. Am. Med. Ass'n, Dec. 5, 1914, p. 2025.

Melchoir—Die Beziehungen der Thymus zur Basedowschen Krankheit. Centralblatt f. d. Grenzgeb. d. Med. u. Chirur. Vol. XV, 1912, p. 166.

Morel—Syndromes Thymiques. Paris Médical, No. 7, 1914, p. 161.
Myers—Congenital Laryngeal Stridor Apparently Due to Enlarged Thymus Gland. Archiv. of Pediatrics, XXV, p. 1908, p. 617.
Nörregaard—Ueber Thyroiditis. Trans. Danish Oto-Laryngol. Society, October, 1914. International Centralblatt f. Ohrenheilkd. Vol. XIII, No. 1, 1915, p. 16.
Oertel—Die chronische Mandelgruben Infektion und ihre Behandlung durch Tonsillektomie. Beiträge zur Anatomie, Physiologie, Pathologie u. Therapie des Ohres, der Nase und des Halses. VI, 1913, p. 174.
Oppenheim—Die Basedowsche Krankheit. Lehrbuch der Nervenkrankheiten. II, p. 1811. VI Edition. Berlin, 1913.
Oswald—Der gegenwärtige Stand der Thymus. Lehre und ihre Beziehungen zur Pathologie. Schweizer Rundschau f. Med., No. 1, 1912.
Pineles—Ueber parathyreogenen Laryngospasmus. Wiener Klin. Wochenschrift, No. 18, 1908.
Poensgen—Beiträge zur Frage der Wechsel Beziehungen zwischen Thymus, Schilddrüse und lymphathischem System. Medizinische Klinik., No. 37, 1914, p. 1504.
Quervain, de—Die akute, nicht eiterige Tyroiditis. Mitteilungen aus den Grenzgeb. d. Med. u. Chir. II. Supplement, 1904.
Quervain, de—Naso-Pharyngeal Catarrh and Angina. Ueber die Aetiologie der Strumitis. 1892.
Roberston—Acute Inflammation of the Thyroid Gland. The Lancet, April 8, 1911, p. 930.
Rosenow—Mouth Infection as a Source of Systemic Disease. Jrl. Am. Med. Ass'n, Dec. 5, 1914, p. 2026.
Sattler—Die Basewowsche Krankheit. Monograph, 1909, Part I, p. 266.
Schwinn—Thymic Asthma with Report of a Case of Thymectomy and Resection of Enlarged Thyroid in a Child 2 3Days Old. Jrl. Am. Med. Ass'n, June 20, 1908.
Shurly—Relation of the Tonsils to Thyroid Disease. Trans. Am. Laryngol. Ass'n, Vol. 36, 1914, p. 169.
Spirig—Korrespondenz Blatt f. Schw. Aertzte, 1891, p. 49.
Stein—Acute Inflammation of the Thyroid Gland. Laryngoscope, August, 1912.
Stein—Laryngo-Tracheal Manifestations of Thyroid Disease. The Laryngoscope, March, 1913, p. 176.
Tavel—Ueber die Aetiologie der Strumitis. Ein Beitrag zur Lehre von den haemetogenen Infektionen. Monograph, Basel, 1892.
Theisen—Acute Thyroiditis as a Complication of Acute Tonsilitis. Albany Med. Annals, August, 1913.
Voorhees—A case of Acute Thyroiditis. Medical Record, Nov. 21, 1914, p. 883.
Weber—Ia thyroidite aigue simple (non suppuré). Simple acute (non-suppurative) thyroiditis. Revue Medicale de la Luisse Romenade, March, 1909.

SOME STATISTICAL OBSERVATIONS ON OTO-LARYNGOLOGICAL DISEASES AMONG NEGROES BASED ON FIFTEEN HUNDRED CASES.

BY DUNBAR ROY, MD.

Racial peculiarities must ever remain a characteristic of disease. Whether such be due to climate, to civilization, to environment or hereditary influences must be left to a further study of the human race.

In considering the diseases embraced under the term oto-laryngological we will find that the above statement is especially true. It is the purpose of this paper to call attention to the diseased conditions found in the upper respiratory tract among the negro race based upon a study of 1,500 cases treated during the last few years at my clinic in the Atlanta College of Medicine, which was formerly the Atlanta College of Physicians and Surgeons.

The study of these cases will show us that the negro race is especially susceptible to certain diseased conditions and almost immune to others. This also is surprising, because the negro race is by no means noted for its cleanliness and often its mode of living and home environments would lead us to expect a certain prevalence of infectious and contagious diseases. A close study of these 1,500 cases will show some erroneous statements which have previously been made in reference to certain diseased conditions among the negro race.

That a statistical summary of these may be more clearly understood we have divided them into (1) Nasal, (2) Pharyngeal and Laryngeal, (3) Aural.

I. NASAL.

It is surprising how few negroes present themselves for a diseased condition of the nasal cavities. Out of the total of 1,500 cases only 341 came for consultation on account of some nasal disease.

The following is a summary of the pathologic conditions found:

Deviation of the columnar cartilages	1
Atrophic rhinitis (true ozena)	2
Hay fever	2
Acute abscess of the maxillary sinus	2
Deviations of the septum	2
Spurs of the nasal septum	3
Acute rhinitis	15
Acute frontal, ethmoidal and sphenoidal sinusitis	30
Purilent rhinitis in children	40
Chronic ethmoiditis with polypus	45
Syphilis, septum and outer wall	90
Hypertrophic rhinitis (inferior and middle turbinate)	109
Total	341

In studying these cases we are struck with some marked peculiarities. Spurs and deviations of the septum are extremely rare. This I believe to be due to two facts: first, in the development of the maxillary bones you rarely ever see the high arched and contracted palate which is so often found associated with deviated septums. In the negro this is seldom seen for a broad face and consequently a broad palate is the usual rule. This fact tends to substantiate Mosher's argument as to the importance of the pre maxillary ridge in the causation of septum deviations.

In the second place traumatism as a causal factor in septum deviations is almost universally accepted but in the negro this is greatly minimized by the presence of a protruding brow and a soft flat resilient nose which is less likely to show the marks of a violent encounter.

In the full-blooded negro I have never seen a deviation of the septum, i.e., to the point where one might observe a decided bend, and the only two cases which were seen occurred in mulattoes and gave a history of previous traumatism. This I consider quite remarkable that out of 1,500 patients only two should show a deviated septum.

Acute inflammation of the frontal, ethmoidal and sphenoidal sinuses were seen in five cases, which was also quite remarkable to similar cases seen among the white patients. This I attribute to the fact that the nasal cavities in the negro are large and roomy free from obstructions and consequently offer a perfect drainage for all of the sinuses.

This but exemplifies the fact that acute sinusitis is largely dependent upon the obstructions offered to the natural outflow of the secretions from these cavities. There were only two cases of acute abscess of the maxillary sinus, both of which fully recovered through natural drainage.

Not a single case of chronic maxillary sinusitis was seen, which is also remarkable. While in the South we do not find this condition as frequent perhaps as it occurs in the North, yet we do have a number of cases that even come to operation. Negroes as a rule have the most perfect teeth of any race of people, and this may in a large measure be the cause of their freedom from antral disease.

Chronic necrosing ethmoiditis with polypus was found in sixty-five cases. This seems remarkable because the acute sinusitis was so rarely found. In nearly every case this condition was associated with a hypertrophy of the inferior turbinates. This hypertrophy was quite characteristic in that the mucous membrane over the turbinates was thick and leathery, presenting a peculiar gelatinous mulberry appearance of a decided anemic color. This condition is quite prevalent among all negroes and yields readily to the treatment by means of the electric cautery. This gelatinous hypertrophy when it involved the middle turbinates very quickly passed into a condition of polypus.

Hay fever was seen in two cases which in no wise differed from the same condition in the whites. Inquiry among my colleagues would lead me to say that hay fever is rare among the negroes.

Atrophic rhinitis was only seen in one case and even here there was an element of doubt with the possibility of its having a specific basis. This also is at variance with the theory of those who hold that a flat roomy nose with large nostrils is the type most usually found where atrophic rhinitis exists and for this reason they hold that such a nose predisposes one to this disease. The facts as stated by me certainly seem to controvert this theory.

Syphilitic lesions were comparatively frequent and every type of this disease was represented. Unfortunately for this race of people, syphilis seems to have permeated its whole vital system. In a large public clinic one may observe all its various forms both acquired and hereditary. Gummatous destruction of septum and

turbinates especially the middle, perforations through the floor of the nose and hard palate these and every other manifold specific lesion can be found.

I wish to call attention to the frequency of purulent rhinitis in the very young. This always had a syphilitic basis and yielded readily to antisyphilitic remedies. This in a measure controverts the theory of those who hold that atrophic rhinitis is dependent upon a previous purulent rhinitis in children. If this was true we would certainly see very many more of the atrophic cases than are really observed in this race of people.

II. DISEASES OF THE PHARYNX. EPIPHARYNX AND LARYNX.

1. Vincent's angina	2
2. Complete atresia of the pharynx and naso-pharynx	2
3. Laryngeal paralysis	3
4. Pharyngeal diphtheria	5
5. Syphilis of larynx	10
6. Elongated uvula	11
7. Chronic granular pharyngitis	20
8. Hypertrophy of lingual tonsil	21
9. Laryngeal tuberculosis	23
10. Pre-tonsillar abscess	50
11. Acute diffused tonsillitis and epipharyngitis	40
12. Acute follicular tonsillitis and epipharyngitis	60
13. Adenoids	96
14. Enlarged faucial tonsils	152
15. Adenoids and enlarged faucial tonsils	296
16. Syphilis of pharynx and epipharanx	270
Total	1061

In this list there will be found only two cases of laryngeal paralysis and both occurred on the left side as an adductor lesion. They recovered in a few weeks under the use of the iodide of potassium.

I have looked carefully for the various forms of laryngeal paralyses among this race of people because of the prevalence of syphilis in all its forms especially since optic nerve atrophy is so very common but so far these are the only cases I have ever seen.

Diphtheria is an exceedingly rare disease among the negroes when we realize the fact that during the last year only seven cases were positively recognized among the negroes in Atlanta out of

a negro population of 35,000. Only five cases were seen by me out of a total of 1,500 who consulted the clinic for various throat maladies and these presented themselves during the last three years. No case of nasal diphtheria was seen although this form of the disease has been very prevalent in our city during the last few years. If unsanitary living can be attributed as a cause for diphtheria we would certainly expect to find the disease prevalent in the negroes. Consequently there must be some deciding factor which affects more frequently the white race in this disease. More prominent than everything else stands the prevalence of syphilis among these people. It occurred 270 times on the pharynx, tonsils soft palate and epipharynx in all its forms from the initial lesion (one case) to a gummatous destruction of all the tissues and in one case even involving the bony vertebrae. It was by no means uncommon to have these patients present themselves with an entire destruction of the soft palate and even the hard. Usually these cases never present themselves until a decided destruction has taken place, always relying upon some home remedy to effect a cure and in this way allowing the ravages of syphilis to produce great destruction. It is in these cases of active gummatous destruction that Salvarsan produces such marvelous results.

Syphilis of the larynx was not near so frequent, occurring only 10 times out of the total number of cases. This differs somewhat from laryngeal tuberculosis, since 20 cases of this disease were seen. Tuberculosis is exceedingly prevalent among the negroes and is one of the most fatal maladies which occurs among them. It is strange therefore that not more cases of laryngeal tuberculosis are not seen in a large out-door clinic where large numbers of negroes come to be treated for every known disease. Several years ago the statement was frequently made, and strange to say by some southern laryngologists, that adenoids were rarly found among the negroes. The statistics here published would certainly disprove such a contention. The fact is adenoids are almost as prevalent among this race as among the white, and since the medical inspection of colored schools have been instituted in our city we find our clinics crowded with colored children seeking to be operated upon for the presence of adenoids and enlarged tonsils.

III. DISEASES OF THE EAR.

Aural diseases are not very frequent among the negroes. Out of the total of 1,500 patients only 125 consulted the clinic for some affection of the ears.

Following is a tabulated list:

1. Facial paralysis	1
2. Atresia of the external canal	2
3. Foreign body in external canal	2
4. Progressive deafness (so-called dry catarrh of middle ear)	3
5. Acute suppurative otitis media	5
6. Chronic catarrhal otitis media	6
7. Furunculosis of the auditory canal	8
8. Chronic suppurative otitis media	8
9. Eczema of the auditory canal	10
10. Otalgia from reflex causes, teeth, tonsils, etc	13
12. Tinnitus with retracted drums	24
13. Cerumen	26
11. Acute catarrhal otitis media	17
Total	125

Middle ear inflammation is comparatively infrequent among the negro race. This is also true of the white race in our climate as compared with that which occurs in more northern states. However middle ear disease is noticeably very rare among negroes, especially that form which is usually spoken of as dry catarrh accompanied with gradually increasing deafness. Out of this tabulated series there were only three cases of this kind, and in looking back on my clinical experience of fifteen years in the same clinic, I can recall but very few negroes who presented themselves on account of progressive deafness. This to my mind can only be attributed to unusual free respiratory room in the nasal cavities and the almost absolute freedom from nasal obstructions. This latter condition is by no means a *sine qua non* as a factor in producing progressive deafness as the histories of such cases will attest, but it certainly is a contributing cause and cannot be disregarded. The auditory canals in this race are usually very large and seldom is it even necessary to use a speculum to observe the membrana tympani.

One class of cases mentioned in this list is worthy of comment and are quite numerous.

These are the cases where the chief complaint is tinnitus, and the only objective symptom found is a retracted drum. Functional testing always fails to elicit any positive results. They are always associated with chronic constipation and its attendent sequella intestinal toxemia. It is not unusual to elicit the fact that their bowels have not acted for five days. A thorough elimination will speedily cure all these symptoms which shows that the same is toxic in origin.

In conclusion I wish to say that all of these cases have been studied very carefully and these observations have been made as representing my own clinical experience. It was stated at the beginning of this paper climatic influences and local environments may possibly play an important role in these statistics which will cause such observations to differ from those of other southern confreres. However this will certainly add to the sum total of our knowledge and produce further statistical observations along this line by men whose clinical opportunities will afford them ample cause to agree or disagree with my own clinical experience.

REPORT OF PROGRESS OF A CASE OF PITUITARY TUMOR REPORTED IN 1914.

BY T. H. HALSTED, M.D.

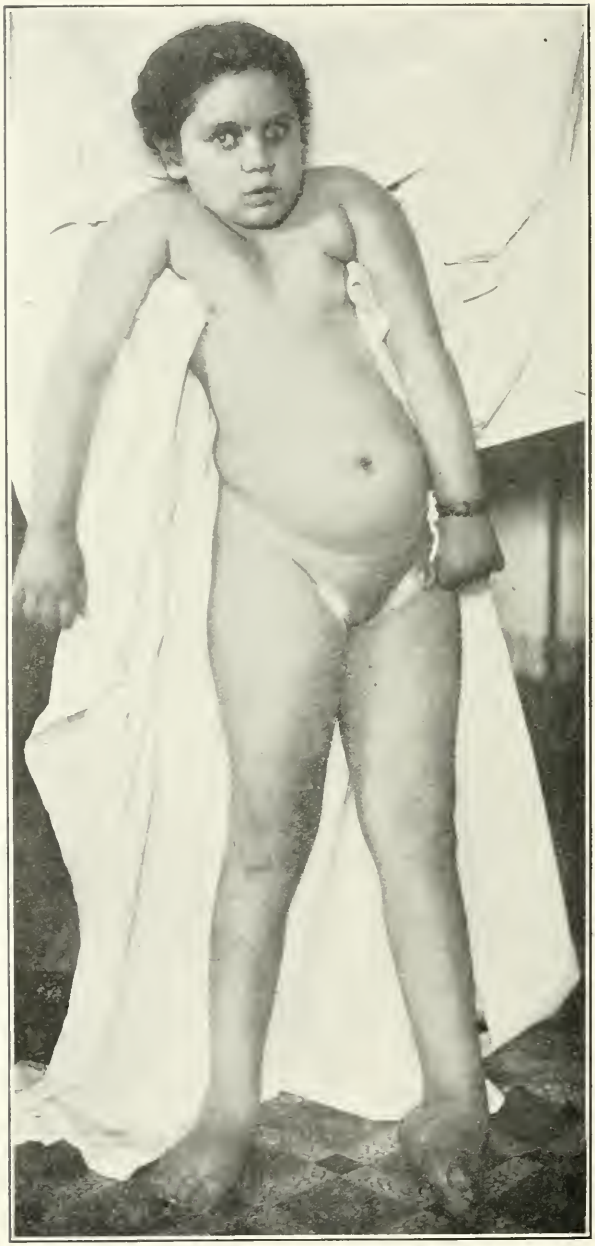
At the last meeting of this society I reported a case of cyst of the hypophysis, occurring in an Italian girl nine years of age upon whom I operated, following the method of Hirsch, doing the operation in three stages under cocaine anesthesia.

This child came under my observation for the first time on February 6th, 1914, fifteen months ago, at which time she presented briefly the following symptoms:

She was very large for her age, marked and increasing adiposity, skin was dry and harsh, hair dry and coarse, growing low on the forehead, eyes large, pupils dilated, marked general ataxia with intention tremor, choreiform movements, well marked athetosis, paralysis of the pupil, deep and superficial reflexes not altered. There was extreme difficulty in making co-ordinated movements, gait was unsteady, complained of frequent dizzy spells, headaches were very severe nearly every other night and the sight was decidedly impaired. She was unusually bright mentally. An X-ray showed the sella turcica to be somewhat larger than the average normal at this age, while above and posterior to the sella the brain area was of lessened density.

All the operative work was under 5 per cent. cocaine with 1-2000 adrenalin and was done in three stages, the last stage consisting in incising the tumor which proved to be a cyst, liberating about one-half an ounce of clear, limpid, straw colored fluid and was followed by quite a decided change in the symptoms.

The child recovered from these operations, finally being taken to her home in a neighboring village three months after the last operation, on the whole not improved by her surgical experience, the cyst evidently having refilled. The parents declined further operation and I have seen her only two or three times, as I have gone out to see her at her home. Pituitrin was given for several months but for six months she has been without it. Her present condition is as follows:



Child is now ten years of age and is confined constantly to bed. Muscular weakness is so great that she cannot walk unaided, and to assume the upright position must be literally held or propped up. She can sit up in an arm chair or rocker with arm and head supports. There has been an enormous increase in adiposity, the fat being distributed throughout the body, while her head has increased to a size that for her age is almost huge. Comparing the measurements of her head with that of two sisters, one a year older and one a year younger, it is found that the measurement of the circumference on a level with the parietal eminences is in the older child 21 inches, the younger 20¾ inches, while the patient's head measures 25 inches. The vertical measurement of the circumference under the chin, back of the ears, taking in the parietal eminences, is for the older child 23 inches, the younger 23½ inches, while the patient's measurement is 26½ inches in this circumference. While the patient's head was larger than normal at the time of operations fifteen months ago, the increase in size since that time has been most striking. The color of the hair is a very dark brown, has not increased in coarseness, and the tendency to become reddish, as a year ago, has ceased. There is a marked tendency to somnolence most of the time, the child sleeping a great deal during the day as well as night, although for some days and for a week or two at a time this may not be the case. She is unable to feed herself because of the inco-ordinated movements and the lack of muscular strength. Intention tremor is very marked. She cannot wipe her face because of the tremor nor approximate the finger tips. On attempting to stand alone the foot is drawn inward and upward in the position the foot would assume in standing on the outside of the foot. She is unable to hold her head up unaided, apparently due to lack of muscular strength, and the jerking tremor.

The cranial nerves are apparently normal excepting the optic. Reaction to light is much impaired. Pupils are not widely dilated. She can distinguish fingers at six feet. The motor nerves all functionate but are weak. She can distinguish heat and cold. Reflexes are exaggerated. Babinski is marked. There is apparently no great increase in the amount of urine, though it is frequently passed involuntarily. Stools the same. Speech is diffi-

cult and thick. Memory does not appear to be very greatly impaired. For instance, she asked by name after many of the patients and nurses she had not seen in fifteen months. On examination of the nose it is found that the base of the sella covered by the mucous membrane is freely seen, the anterior wall of the sphenoid being absent. It would be a very simple matter to re-

incise the tumor if the parents' consent were granted or if it seemed advisable to do so. I have not urged an operation because of the almost certainty that the cyst would soon refill. The accompanying photographs give a very clear picture of the child's general appearance.

Discussion.

Dr. John F. Barnhill, Indianapolis: I have employed the Cushing method, using the Cushing retractors. After the parts are dilated the septum can be taken away for the purpose of getting at the anterior wall of the sphenoidal sinus. After that the nose can be dilated as much as needed. This gives a clear-cut view of the field. The Cushing retractor and dilator are absolutely necessary. The speculum itself is built very much like the old Marion Sims bivalve speculum. The operator is not hindered by any hands being in the way. The method is very commendable.

Dr. Halsted, closing the discussion: I have never seen the Cushing operation, so I cannot compare the two. The method which I employed involves a modification which West originally did and to which Coffin called attention, that is, doing the submucous and going on up to the rostrum of the sphenoid and the second operation the posterior part of the septum was taken off completely, mucous membrane and all. That gave a tremendous field. The advantage of the Hirsch method over Cushing's is that it can be done under local anesthesia, in two or three stages, and one gets as good view as is necessary.

HYSTERICAL MUTISM CAUSED BY SHELL EXPLOSION.

BY MARCEL NATIER, M.D., PARIS, FRANCE.

The following case happened with one of the French soldiers on the firing line:

R———, 36 years of age, a farmer by occupation, was mobilized in one of the territorial infantry regiments on August 2, 1914

Family history. His father died six years ago at the age of eighty. He was a hard drinker all his life. His mother, seventy years old, is a petite woman and very sober. There was no consanguinity between the parents and neither of them ever had any defect of speech. A sister, born six years after the birth of the patient, died when eleven years old from pulmonary tuberculosis.

Personal history. The patient was born in the country and always lived there. In his early years he was sickly and suffered from colic and diarrhoea. Between the ages of six and thirteen he attended school; because of his gastro-intestinal illness he was often behind in his class. At times he was obliged to remain in bed for a week. After leaving school at thirteen he worked in the fields until he was twenty-one years old. He then spent a year in military service. Except for occasional recurrences of his intestinal condition he enjoyed good health while with his regiment. At the completion of his military service he returned to the farm. At the age of thirty he married a vigorous, healthy girl, and three children, all in good health, were born of this union. He never had any venereal disease and according to the patient's statement he never had had any promiscuous sexual relations whatever.

As far back as he could remember he was always very nervous. He was also subject to headaches which would recur every fortnight and persist for two or three days. They would come on while at work just as well as while at home and would be preceded by a sensation of throbbing in front of the head between the eyes accompanied by vertigo and vomiting. On such

occasions he was compelled to lie down and would emerge from the crisis greatly fatigued. He never had any defect of speech.

His sleep was mediocre and would frequently be disturbed by dreams and nightmares. These would, in fact, be so vivid that the nervous excitement would throw him out of bed.

The patient never drank any strong alcohol. He used to drink a cup of *cafe noir* in the morning as a bracer and during the day two or three liters of cider. He was always sober, however. During the past two or three years he has replaced the cider by an equal quantity of milk. Milk is now his usual drink.

In infancy the patient had frequent attacks of coryza and has always had a tendency to colds and sore throat.

After being mobilized the patient was sent to the firing line in Belgium. The first battle in which he was engaged was near Bapaume on September 26, 1914, and he remained on the firing line until October third. On that day a shell exploded immediately near him on his right, and the force of the explosion hurled him, together with the earth ripped up, a distance of five or six meters to the left. On the way to the field hospital he was exposed to a veritable hail of shells. At this time he was still able to talk to his colonel, but later it was found that he had lost the power of speech and had suffered a right hemiplegia.

At Guingamp, where he was transported, electrotherapy was employed to the right half of the body and the laryngeal region. At the end of a week he showed a slight degree of mobility in his right arm and thigh. But the results having been considered insufficient the patient was removed to the Salpêtière in Paris.

Here a thorough examination showed the following:

Lower limb.—Foot adducted and internally rotated; the leg can be raised about 5 c.m. above the plane of the bed; slight flexion of the leg on thigh, flexion of thigh on pelvis impossible because of pain and rigidity.

Muscular force.—The patient is able to hold his leg stiff and resist flexion. Complete abolition of foot movements. Owing to the absence of contracture at the ankle equinism and internal rotation easy to correct. Hip movements very limited and painful.

Tendinous reflexes.—(a) Patellar, slightly diminished; (b) Achilles, partially abolished.

Cutaneous reflexes.—(a) Cutaneo-plantar, abolished on the right, normal on left; (b) cremasteric, abolished on both sides; (c) abdominal, normal on both sides.

Superficial sensibility.—(a) Tactile, (b) thermic, (c) pain: anesthesia of the leg: hyperesthesia of the thigh.

Deep sensibility.—Pain on pressure; same zones as in superficial sensibility.

Osseous sensibility.—Complete anesthesia of the bones in the foot and the right leg; hyperesthesia of the femur and of the pelvic bones.

Weber's circles.—Negative on thigh.

Sense of localization.—Nil.

Sense of attitude.—Completely abolished in the toes and the heel. Some atrophy of the muscles of the right thigh. Tactile, pain, thermic and osseous hyperesthesia of the right half of the pelvis.

Upper limbs.—Active and passive motion normal.

Sensibility.—Except for hyperesthesia, normal. No trophic disturbances. Hyperesthesia of the right half of the face and head. Corneal reflex abolished on the right. Pupillary reaction normal to light and convergence. Anesthesia to pain, heat and tactile sense of the buccal mucosa and tongue. No pharyngeal reflex.

Tendinous reflexes.—(a) Olecranon, normal; (b) radial and cubitopronator, slightly diminished.

Lumbar puncture.—Fluid clear; hypertension; no hyperalbumosis or lymphocytosis.

Psychic state.—Patient very emotional and cries easily. He understands his surroundings perfectly well and also the questions asked him. He makes efforts to talk but these provoke violent contractions of all the facial muscles. No disturbances of memory.

Ophthalmological examination.—Negative.

In view of the above findings pointing to hysteria I proposed *respiratory gymnastics.* These exercises were carried out and a complete cure attained by means of them.

It is only by a perfect understanding of the terrain on which the apparent disease is based that the true state of affairs can be recognized. The minutest details in the personal and family his-

tory must be gone into and interpreted properly. Applied to our soldier these principles leave the mark of their influence. His father's intemperance and his own neuropathic temperament have contributed to reduce his organic resistance. The suddenness and totality of his mutism are explained by the condition which caused them—the sudden, terrific shell explosion. The complete right hemiplegia that accompanied the mutism speaks in favor of the theory with which this kind of mutism is related, disorders analagous to those which occur in the speech center in aphasia. The analogy is not, however, absolute, for there are numerous cases of hysterical mutism without any motor or sensory disturbances on the right side or the disturbances may present the most diverse localizations.

Simulation was ruled out by the conduct of the patient himself. His fervid desire to recover his speech was attested by his repeated efforts to talk and his real chagrin at his inability to do so. And it was further proved by his sincere joy when he was cured.

The uncertain duration of the affection which may last not only for weeks but for months and years is likely to make the prognosis gloomy which is otherwise favorable.

Laryngoscopic examination should never be neglected. It furnishes variable results. No trace of an apparent disorder may be found in the larynx. On the other hand, functional paralysis either of one or the other vocal cord may frequently be encountered. More rarely, the cords may be in abduction, or in adduction or in an intermediary position. In the case of our soldier at every effort to speak he closed his glottis hermetically by an energetic constriction which exaggerated every new effort.

These diverse and even contradictory symptoms come from motor incoordination of the larynx; they clearly exclude the blame on any one vocal cord for the complete loss of speech which characterizes hysterical mutism. It is due to a more general cause. Thus psychic influence has been invoked as the essential and necessary condition for the genesis of this particular affection. It is also necessary to bear in mind that the motor incoordination is not confined to the larynx but that it may affect the entire respiratory system.

The therapeutic procedures for hysterical mutism have been the most varied, and as with all hysterical patients what will act with one will not act with the other and vice versa. According to the point of view taken it may be said that the procedures adopted are of two kinds: the first, brusque and even violent, the second, soft and persuasive. The former may tend to increase the obstinacy and defiance of the patient. The latter consisting as it does of patience and softness appeals to the patient's reason and tends to convince him of the benignity of his condition.

Conclusions.

Hysterical mutism occasioned by a vivid emotion (fright, chagrin, traumatism) sets in suddenly and rarely progressively.

The very nature of the affection supposes the existence of a predisposed soil, an organism in more or less unstable equilibrium.

Treatment by persuasion and patience is almost always crowned with success.

Motor incoordination, not only of the larynx, but of the whole respiratory system may well cause obstinate persistence of the hysterical mutism. This should be corrected by appropriate gymnastic exercises.

(*Candidates' Thesis.*)

SUSPENSION LARYNGOSCOPY AND ITS ACCOMPLISHMENTS.

BY ROBERT CLYDE LYNCH, M.D.

Can you imagine the peculiar sensations that must have greeted Prof. Gustave Killian when he viewed for the first time the larynx of a cadaver brought into view by a tongue depressor, placed over the tongue and epiglottis, the handle of which was swung from a support at the side of the table, the subject's head hanging free?

To sit comfortably in front of the open mouth and view deliberately the larynx, without the "time honored" fatigue of either your arm or that of an assistant, must have created a certain sensation of joy and satisfaction hard to describe. This was the birth of *suspension laryngoscopy,* some time in the winter of 1909. According to Killian much experimental work was done before the method was decided to be sufficiently developed for presentation to the laryngological world at the International Laryngological Congress in Berlin in 1911. From this period until the present time the method has been used by laryngologists the world over, and there began to appear varying views and modifications, as a natural consequence.

At the meeting of the American Laryngological, Rhinological and Otological Society, held in Washington, D. C., in May, 1913, I saw Dr. Wolf Freudenthal demonstrate the apparatus, and later had the pleasure of viewing the larynx of a case suspended by him, at the Beth Israel Hospital, New York City. I became enthused with the possibilities of the method and purchased an instrument of the latest Killian design.

I began the use of the Suspension Laryngoscope, and with the increasing acquaintance I dreamed more and more of its possibilities—but at the same time realized that much was lacking in what I had considered a "perfect" instrument. I was soon impressed with the fact that the range of usefulness of the outfit would be decidedly limited unless I were able to view the anterior comissure of the larynx in every case. The children gave me but little

trouble, but in adult cases I could not see nearly as much as I desired. Small tumors far forward in the anterior third of the larynx were not in view, and try as I might, I could not adjust the instrument satisfactorily. The "Gallows," as Prof. Killian has called it—was not long enough; its attachment to my operating table was not straight or square, its motion horizontally was limited, and many times I felt that if it were only four inches longer I could see ten times better. The hook was frail, and after use on an adult case, would have to go to the instrument maker's to be straightened. Then I could not gain space enough through the opening to see well, realizing that a Jackson or a Mosher Spatula would yield a much broader field of view. The tongue would slip from side to side and when in the middle line, would so fold around the Spatula as to convert the field of vision into a tube whose caliber was too small for any use.

To correct these troubles was now my desire, for it was plain always that the principle as proposed and executed by Killian was thoroughly proper and correct. Taking then as my goal of acquirement, the anterior commissure of the larynx with a wide open mouth and an unobstructed view of the parts concerned, I set about surmounting the difficulties as they arose and as they appeared to me.

I had made a table top from a cypress board six feet long and eighteen inches wide, fixed with clamps to fit any operating table so that it would be perfectly rigid under all circumstances. At one end, a section twelve inches deep and fourteen inches wide was cut out, and hinged to drop at right angles to the surface, this leaving a projecting platform four inches wide and twelve inches long, the purpose of which was to increase the horizontal traveling distance of the gallows by placing the clamp of the gallows forward on the shoulders instead of behind them, as is necessary under ordinary circumstances. Again the hinged portion did away with the necessity of having to drag the patient over the head of the table after the sterile goods had been placed, and a most uncanny feeling to a patient under local anaesthesia. The table top in its original design I still use, and feel that it is one of the very essential units for success. A "wabbly" table is a source of trial at all times, and in one instance my patient ac-

tually slipped off, falling to the floor because of the unbalance produced by the extension of the head beyond the table top, and the body weight coming beyond the center of gravity.

The tooth plate of the mouth gag would invariably stick, its movement—only a quarter inch—was entirely too small to suit all cases, and it was always necessary to make the adjustment before being applied. Again the vertical opening of scarcely one inch was not as long as the mouth would stretch nor large enough for me to see as well as I might. Accordingly, I had constructed the tooth plate and mouth gag described by me at the twentieth annual meeting of the American Laryngological, Rhinological and Otological Society, in Atlantic City. This modification permitted of increase of one inch in the vertical and one in the horizontal, the latter being controlled by a screw which was more powerful and accurate, and would not stick and jam. I worked with these modifications for some time, satisfactorily, I thought, when one day I could not get away from the milled head of the adjusting screw. I could see it all the time, as one must see the black spots in Scotoma, then the platform through which the tooth plate traveled would project into the mouth cavity beyond the tooth line, which interfered very much in the dissecting operations, and finally, while suspending a husky farmer of about 200 pounds, it bent so decidedly under the strain, that I felt that it was neither safe nor satisfactory.

Again the tongue on the main frame to which is attached the various tongue spatulas and which acts as a guide for the vertical movements of the mouth gag, and which must bear the brunt of the leverage, was found first of all to be of brass and consequently to bend easily, and this would actually occur after nearly every case of any size. Then the screw which was used to operate the vertical movement of the mouth gag was so small that it was at times impossible to move it at all during the various stages of introduction.

I set about to correct these "short comings," by making the frame of the instrument of the shape of a reversed L, with the screw that operates the mouth gag working through the end of the horizontal branch of the L—the advantage being a large screw head that could be grasped well and that could be moved at will,

even in the heaviest cases. The tooth plate was made to extend for nearly two inches in the horizontal, working by a worm gear joint and a swivel near the tip. This placed nothing in the mouth cavity beyond the tooth plate, allowed of wide opening of the mouth and was thought to surmount all of the difficulties. It was this instrument that was shown at the meeting of the Middle and Western Sections of the American L. R. & O. Society at Cincinnati. Alas, this whole apparatus was mechanically wrong, and I have mentioned it for that reason. The center of gravity was not in the middle line, consequently the instrument would pull to the side, necessitating the continuous holding of the head by an assistant. The screw moving the mouth gag was pitched too high and would jam so as to be perfectly immovable because the weight was off center. The worm gear joint could not be made strong enough to withstand the weight, and would bend up so as to give but a small opening to the mouth. I will never cease regretting that it was ever displayed.

The instrument that I have been using for the last six weeks has many points in its favor, and seems to be entirely satisfactory up to this time. One realizes that the main requisite for *one* instrument to suit all cases and conditions is *flexibility*. I mean by this, a wide range of motion in every possible direction, all in excess of what is usually needed, that they may be called upon in the unusual cases.

As my work is done on adults as well as on children, I have felt the necessity for strength and power, to overcome the greater muscle tension met with in most adults. Therefore the new instrument is very much heavier in all its parts, and is thought now to be able to stand the severest test possible. The main frame is of heavy steel, broader and thicker than the original, mainly to secure a large milled screw used to open the mouth gag in the vertical direction. This has permitted a larger and stronger shaft to the gag, and the thread is pitched lower to give greater power. In addition, the screw is drilled throughout its circumference to permit the use of a lever or handle, as is done in the manipulation of an ordinary jack-screw. The mouth gag will now open to a full 1¾ inches on the inside, which is much in excess of what is usually used.

In order that the tooth plate of the mouth gag may move freely in the plane of the tongue spatula—a range of motion that is necessary for jacking up the epiglottis and which renders the length of the tongue spatula variable and does away with any projection in the mouth cavity, that may obstruct the view—I utilized the principle of a pear-shaped ring attached to the frame, the movement of which is controlled by a thumb screw. By it one can easily introduce the tooth plate well beyond the line of the teeth of the superior maxilla and so move the tip of the tongue spatula at least one and a half inches, this will permit of the use of the shorter spatula and so bring the operator nearer his work. At the same time there is developed a slightly tilting motion to the tip of the spatula, which will tend to elevate the epiglottis well beyond the field of view. Another feature embodied here and which is an innovation not mentioned by Killian or others, is the provision of adjustable single or multiple tooth plates. One, two or three can be used, depending upon the size, condition and shape of the superior maxilla under suspension. This feature is of especial service in changing from children to adults and from V-shaped to circular arches. Again, it will permit the fixing of the base of a triangle formed by the tooth plates at two points, the tip of the tongue spatula as the apex, and thus prevent the tongue spatula from slipping from side to side and losing one's view in the middle of an operative procedure.

Finally, the base to which the tongue spatulas are attached has been strengthened so as to meet the most rigid demand. The tongue spatulas have been modified into the form of a slight curve with fixed flanges, to prevent the infolding of the tongue. Also, one spatula has been made with movable or adjustable flanges, but this has not seemed necessary and is more complicated.

TECHNIQUE.

Perfect relaxation and quiet are fundamental for the work, and the anaesthetic to acquire these satisfactorily in the patient, will depend upon the condition requiring treatment.

In children, general anaesthesia is by far best and safest, administered by a trained anaestheist, using some for of *warm ether vapor.* I select ether always, for general anaesthesia,

using the warm ether vapor as delivered by the Caine-McDermott ether apparatus, or by compressed air as is used at the Ear, Nose and Throat Hospital in New Orleans, and insist upon my patient being kept continuously in the surgical stage of anaesthesia, instead of being allowed to awaken intermittently as would be the case in ordinary open cone anaesthesia, a most unsafe state for the patient and designed to interfere most annoyingly with the work to be accomplished. The bronchorrhora complained of I have never seen in any of my cases, and so far have had no complications of any kind to tabulate.

My anaesthesia has been so perfectly satisfactory, that I have never felt the necessity of employing either rectal, intravenous or intra tracheal anaesthesia as a substitute. With the ether being delivered into the mouth through a tube or mouth piece by compressed air, the anaesthesia is under the perfect control of the operator, who can watch this phase of the work,—a source of much satisfaction to me. I do not use morphine and atropine before general anaesthesia for I have no desire to benumb the cough reflexes; then, too, many of the cases suffer some from respiratory obstruction which the administration of morphine may depress still more.

In local anaesthesia for adults of a suitable age, I am accustomed to administer morphine, grs. 1/6 to ¼, and scopolamine, grs. 1/150 to 1/100, hypodermically, one hour before operative time. Then with the patient sitting, I apply gently first to the uvula and then to the posterior pharyngeal wall a 10% solution of cocaine, on a cotton applicator. This the patient is requested to spit out. The movements of the parts required in this act being sufficient to procure fair anaesthesia of the fauces and post pharyngeal wall, this preventing gagging, which, once started, is hard to control. I then drop from a laryngeal syringe, about ten drops of a 10% solution of cocaine on to the base of the tongue, lingual face of the epiglottis and hypo-pharyngeal wall, requesting the patient to hawk and spit immediately, that none may be swallowed. A rest of two to five minutes is taken, then from five to ten drops of the same solution is dropped into the larynx, and the patient is requested to cough immediately, that the excess be removed, to obviate the possibility of toxic absorption. With

a short period of rest again the patient is put upon the table prepared for suspension.

Some form of suction apparatus is an absolute necessity to care for the secretions from the salivary glands, and fluid from the œsophagus, also to remove those blood clots that collect upon the posterior tracheal wall as far down as the bifurcation, for picking up fragments of tissue that may be loosened from the grip of the retaining forceps, and to render the operative field clear, reducing the traumatism of sponging very materially,—a very important factor in laryngeal work.

The patient ready, we proceed as follows with all parts except the face, covered with sterile goods: The gallows is fixed to the platform of the table top, usually from four to six inches beyond the hinged portion, or forward of the patient's shoulders, so that its traveling distance in the horizontal is markedly increased. The coarse vertical adjustment is lifted to its limit and the clamps

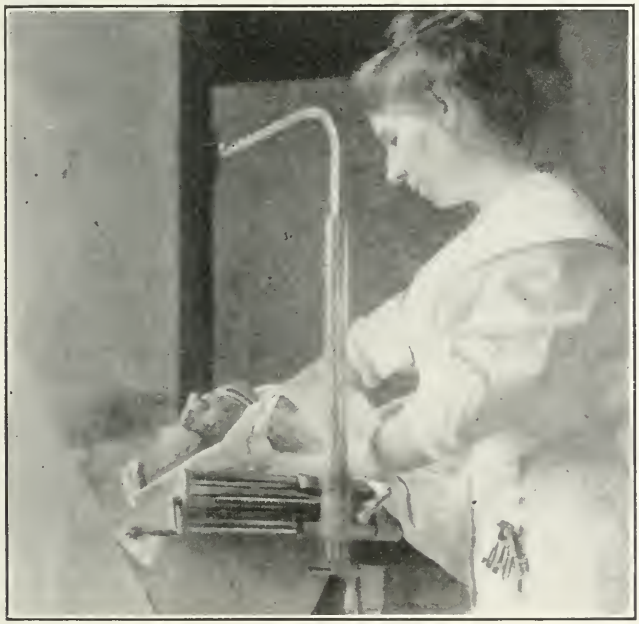


Fig. 1.
Position of patient and assistant.

Fig. 2.
Position of instrument, patient, assistant and hand to steady head.

securely fastened. All parts are seen to be tight and solid, that no accident or slip may occur from this source.

The patient ready is so placed upon the table that his shoulders will project about two inches beyond the hinged joint. This will allow for the hyper extension of the head and keep movement of the occiput from being blocked against the table top.

An assistant standing to the right of the table or crane side, facing the head, holds the head firmly in both hands, being sure at all times to keep the head straight with the body. The hinged portion is dropped and the head is extended somewhat, as is shown in Fig. 1.

I usually now fold a piece of gauze over the teeth of the lower jaw and crowd the tongue back into the mouth, to avoid pinching or lacerating the tongue by its pressure on the teeth,—an accident which has occurred several times.

A suitable tongue spatula and tooth plate having been previously selected and adjusted, the mouth is opened, the instrument closed, the spatula is passed back over the tongue to reach the post pharyngeal wall. The worm gear joint on the shaft of the instrument being adjusted to an angle to lift the hook end away for the assistant's arm,—as is shown in Fig. 2.

The spatula will now assume the relative position as is shown in Fig. 3.

The head is still further extended and held in the middle line, the tongue in the middle line, the tip of the spatula following along

Fig. 3.
Tip of spatula touches post pharyngeal wall.

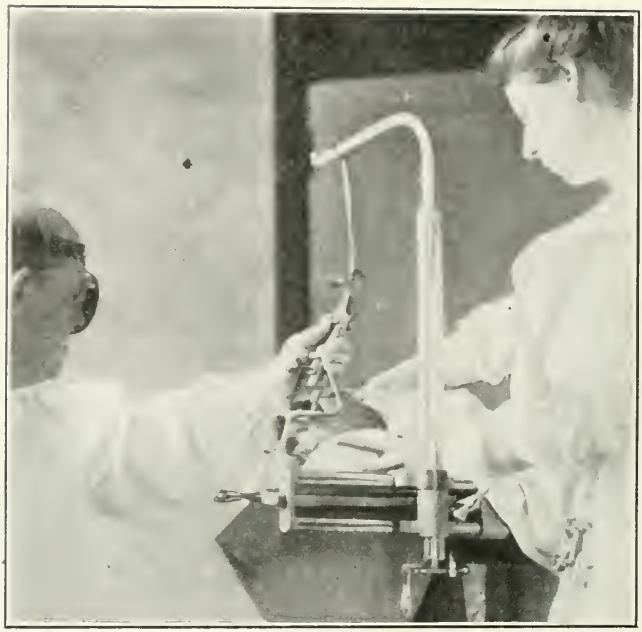


Fig. 4.
Firm grip on instrument to insure proper position. Inspection.

the posterior pharyngeal wall, the tooth plate being placed behind the incisor teeth of the upper jaw, and the hook adjusted into one of the notches of the traveling crane, as is shown in Fig. 4.

A firm hold is maintained on the instrument at all times, that it does not slip from side to side, and all movements are kept in full view at all times.

Now the tooth plate represents the fixed point of the instrument, the tip of the tongue spatula, the movable point, and by turning the screw that moves the ring to which is attached the tooth plate, we succeed in driving the tip of the spatula further into the mouth along the hypopharyngeal wall under the epiglottis, which procedure I have nic-named, "jacking of the epiglottis." The patient's head now hangs free, but a firm hold is maintained upon the instrument that no movement may displace it. I call your attention to the plane and position of the spatula, as is shown in Plate 5.

Fig. 5.
Plane of spatula.

The tip of the spatula is shown in Plate 6, and one can usually see now the pyriform sinuses, the opening of the oesophagus, and the oesophageal surface of the arytenoids. (Fig. 7.)

The teeth are here examined, and if the lips and tongue are not pinched, the patient's general condition is noted for comfort and safety.

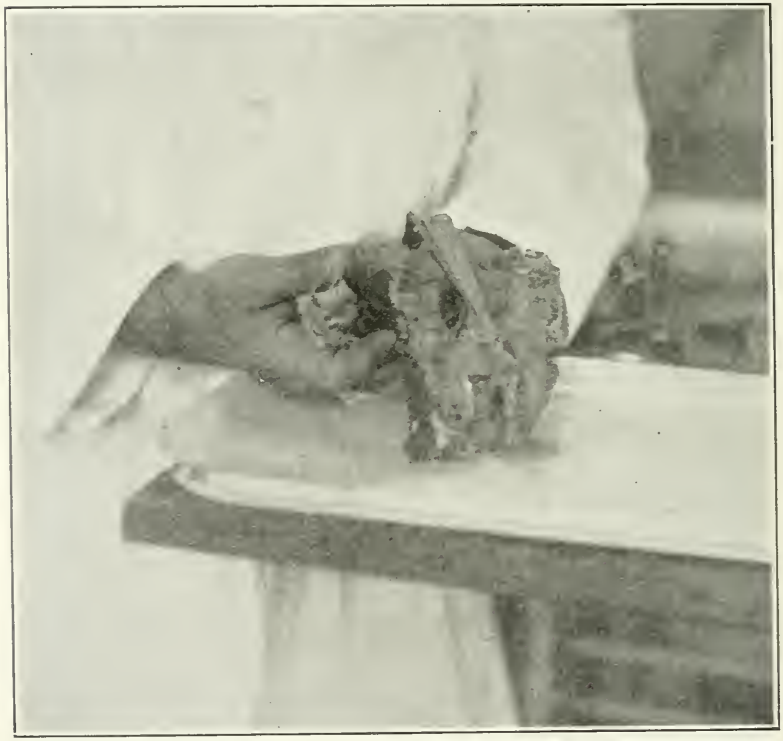


Fig. 6.
Tip of spatula.

The worm gear joint on the shaft is now straightened, which will have the effect of lifting the tip of the spatula towards the epiglottis, and of swinging the head into extension, but I do not carry this movement as far as Killian, for I do not have the transverse portion of the crane to overlay the top of the tongue spatula as Killian suggests (Fig. 8), but use the horizontal movement of

the crane to assist in tilting the tip of the spatula upward that I may still further straighten the road for the larynx and gain a wider field of view, as is shown in Fig. 9.

At this moment, usually all is in fine view, but the anterior ¼ of the larynx, we see tonsil pillars, palate, uvula, hypopharyngeal wall, pyriform sinuses mouth of the oesophagus, arytenoids, posterior, ¾ of the vocal chords, trachea to bifurcation, etc. To

Fig. 7.
Jacking of the epiglottis.

gain the anterior commissure, the vertical movement of the crane is utilized to swing the head free of all support, and in some instances, even the shoulders are lifted by this movement. Then the crane is moved horizontally and the epiglottis jacked a little more until finally we see the anterior commissure of the larynx standing well before us, as is represented by Figs. 10, 11 and 12.

I must call your attention to the marked differences in the two positions, as pictured by Killian and myself. In the former

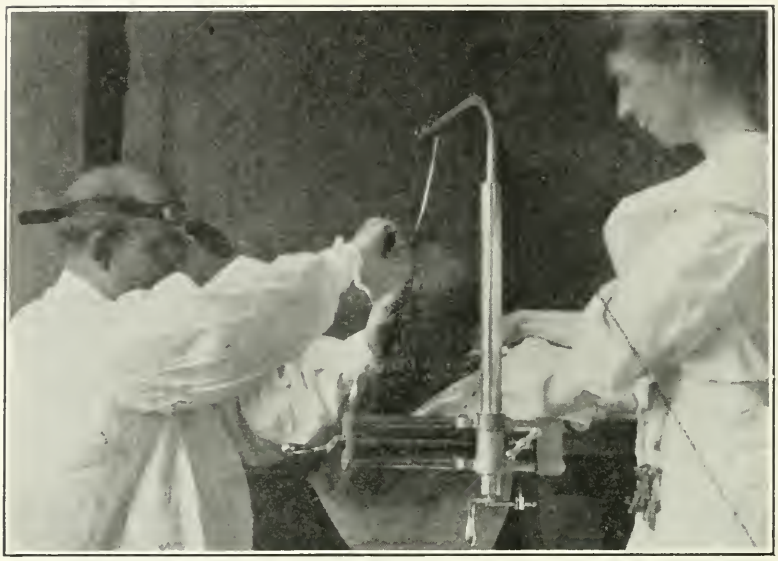


Fig. 8.
Straightening worm gear joint.

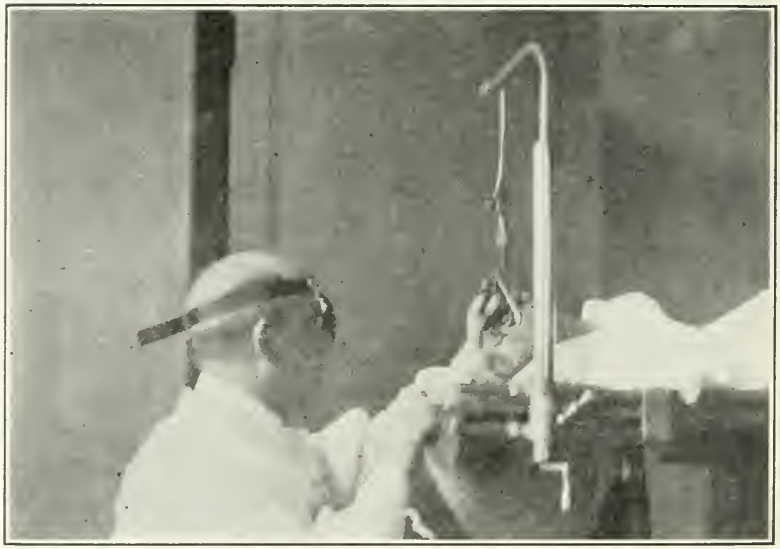


Fig. 9.
Gaining extension by horizontal movement of crane.

instance the crane occupies a position far below the patient's head, the transverse portion of the crane must overlay the tip of the tongue spatula, which will bring the spatula in a perfectly straight line. Since we know, as proven by Jackson and others, and as is shown very nicely by Iglauer in a radiograph in the Laryngoscope, June, 1913, that the larynx and trachea do not proceed in a perfectly straight line into the chest, but go downward

Fig. 10.
Vertical movement of crane to straighten view.

and backward, a perfectly straight line view will not show the anterior commissure in those cases where marked muscle development is present. While, in my position, by gaining marked tilting of the tip of the spatula this muscular tension is overcome and you can acquire a view of the anterior commissure in those cases not otherwise possible.

By referring to Cut 13, Killian's position, you will note the relations of the crane, to head and tip of spatula, also that the spatula occupies a straight position in the mouth, which will not show the anterior commissure. In this case under suspension (a cadaver) while position of crane hook and spatula as shown in Fig. 14, is the one assumed by me in most instances. The spatula

Fig. 11.
Tip pressing on epiglottis to show larynx.

Fig. 12.
Showing relation of spatula to epiglottis.

tilted up at its tip pressing the epiglottis forward to the hyoid bone—as can be seen from the angle of crane of hook—also the straight line assumed by the neck, which I believe is necessary to see the anterior commissure and which is absolutely necessary in adults and rigid cases. As the case is suspended, one can see the anterior commissure perfectly well, and in this position it is possible to do any of the intra-laryngeal operations.

In Fig. 15 I have attempted to photograph the view of the larynx as is shown in Fig. 14, a small Tungsten lamp being placed inside of the mouth and the picture taken with the same camera as I used in the other illustrations. While the photograph is not quite clear enough to study the anatomy of the part, you can recognize the cords, both false and true, and see the anterior commissure. I will call your attention to the view obtained and of

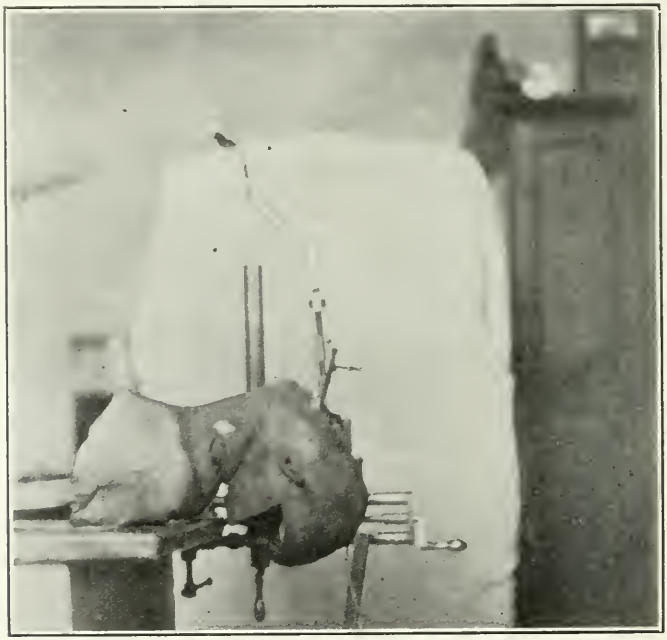


Fig. 13.
Killian's position. Note curve in neck.

the advantages of this instrument, over the others now in use: First, the broad ring to which is attached the mouth gag, brings the pressure in the middle line and balances the instrument in place, at the same time removing every part of the instrument from obstructing the view of the mouth cavity and parts beyond. No screw heads either to the side or in front to attract the attention of the eye or furnish a projection upon which instruments, gauze, etc., may catch during operative work. Again, the

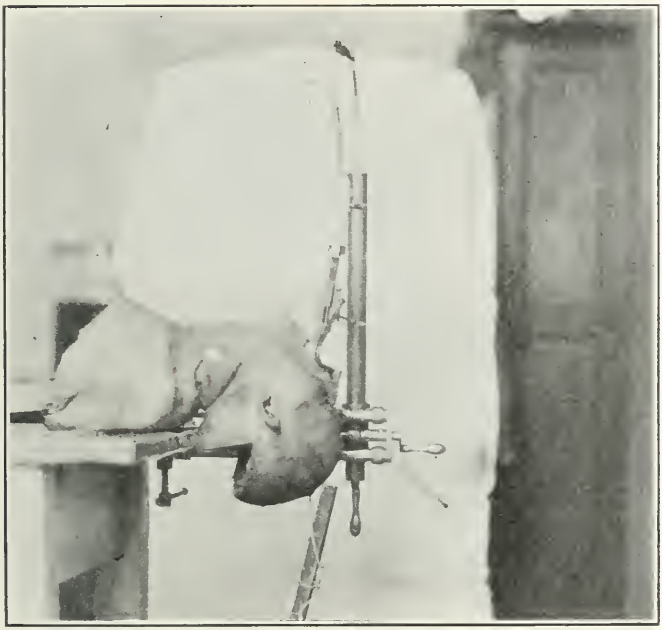


Fig. 14.
Lynch's position. Note straight neck.

ability to open the mouth wide and the large lateral measurement, will permit of the free use of tubes, both bronchoscopic and oesophagoscopic in conjunction with this instrument.

The use of multiple and adjustable tooth plates which are here possible, will give additional service in procuring the proper view, besides being adaptable to various mouths, teeth, etc., etc.

In cases where the epiglottis is made up of very thin cartilage, allowing the structure to fall back against the post pharyngeal wall and when caught up by the spatula will bend backward and form a roll that will obstruct the view of the anterior commissure, or when that organ persists in slipping from the hold of the tongue spatula and will fall like a curtain over the view, or as occurs some time, it will roll under the spatula and fold with its free edge towards the larynx, or when the structure is kinked near the cushion, I have found that driving the epiglottis straight with two bridle sutures placed on either side of the middle line,

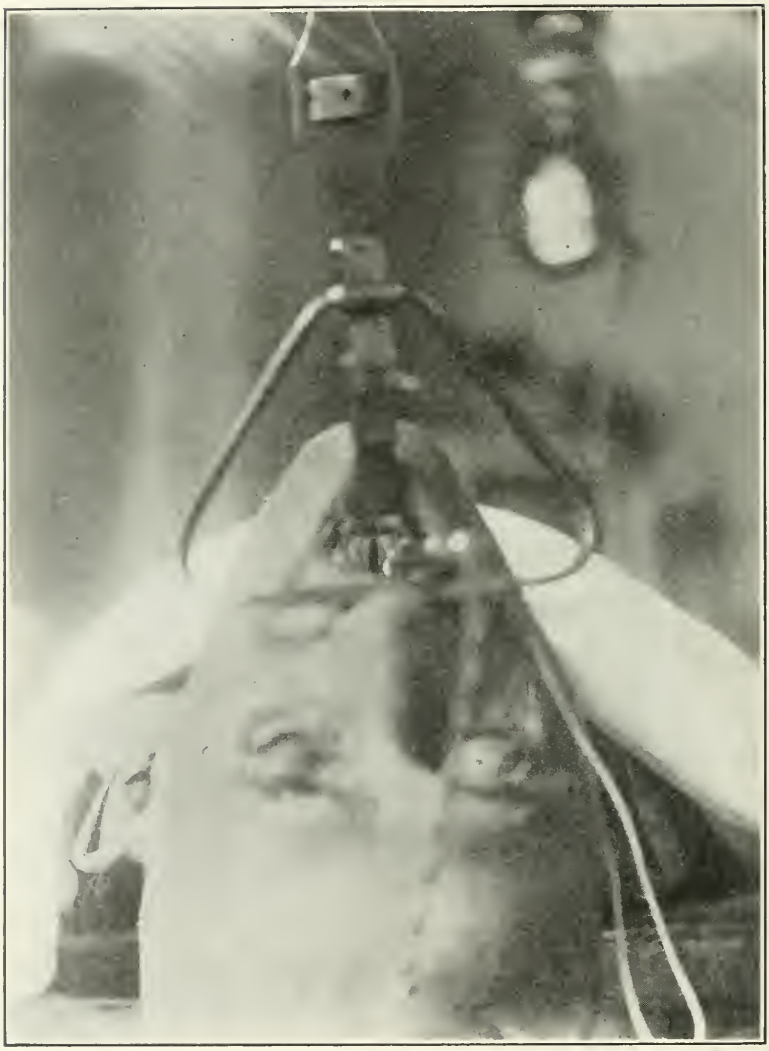


Fig. 15.
View of vocal cords, as seen in Fig. 14.

as is shown in Figure 17 will straighten out all these irregularities. The spatula is introduced along the base of the tongue until the epiglottis is seen and held in this position while the two bridle

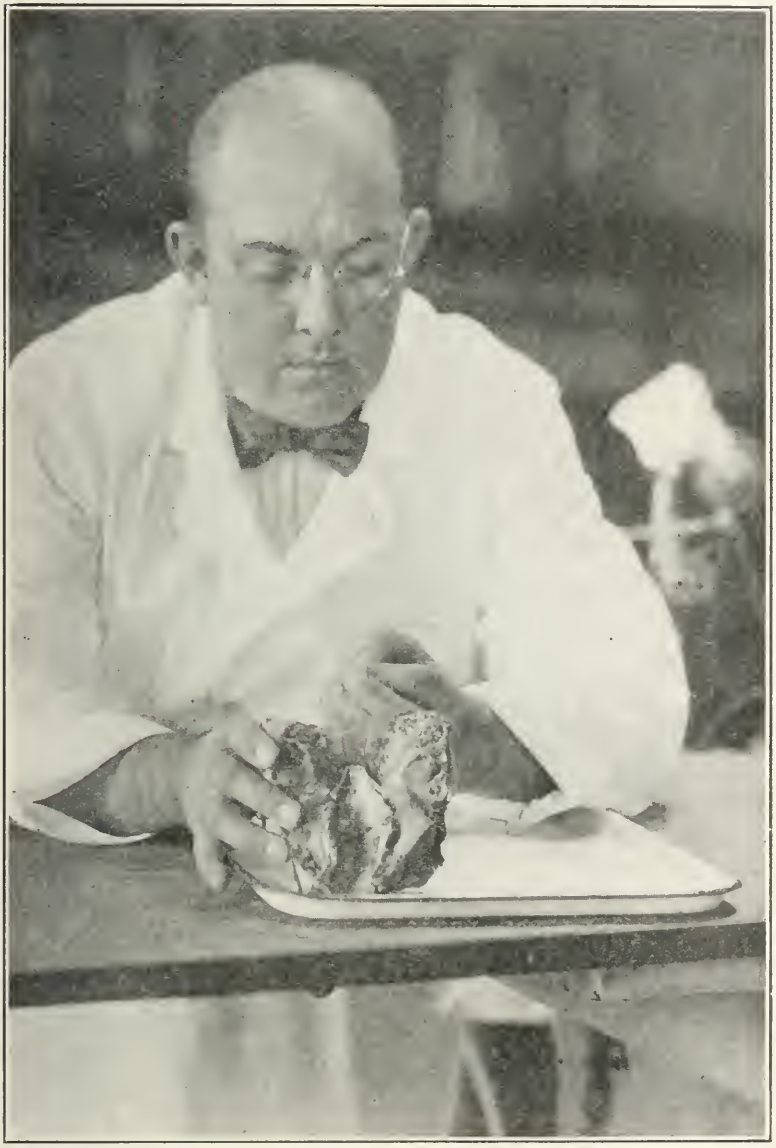


Fig. 16.
Driving epiglottis straight. Position of sutures

stitches are placed, then the spatula is removed, and while the tongue is crowded into the mouth tension is made upon the sutures, and drawing the epiglottis straight, the spatula is introduced as described and the sutures will lie then between the

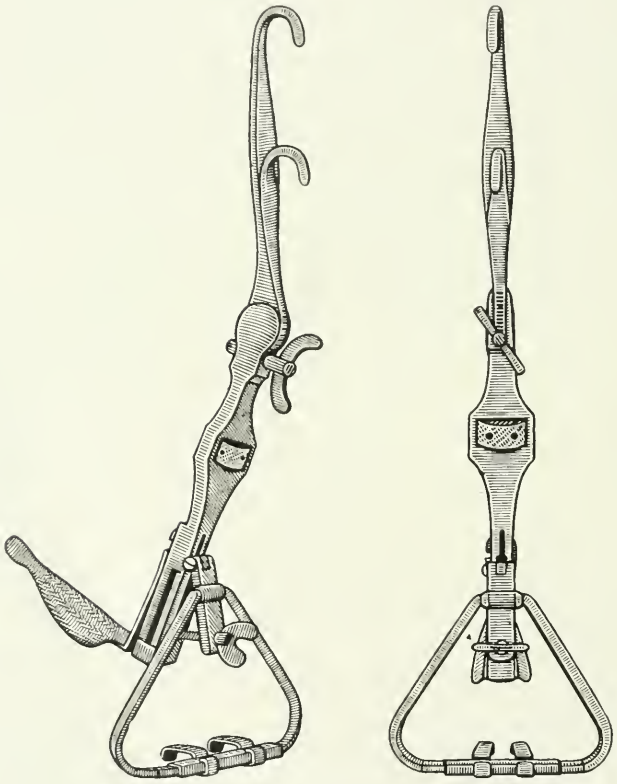


Fig. 17.
Views of instrument.

tongue surface and spatula. If the pressure here is not sufficient to hold them in place, I tie them to the frame of the instrument.

In introducing the spatula, if the tongue should slip to one side and heavy extension is made, one is liable to tear the pillars of the fauces on the side of greatest tension. If force is used in sliding the spatula along the post pharyngeal wall, one is

likely to produce a bruise or laceration of this region. Keep the tongue in the center.

In the mouths of old people where the teeth are brittle or carious or uneven, one may have trouble in finding a suitable base for the tooth plate to rest against. My adjustable tooth plates will correct this, or some form of dental mould can be made to distribute the pressure along the upper jaw. A rubber tube split longitudinally and slipped over the teeth will keep them from harm, likewise a small roll of gauze placed between the teeth and the tooth plate will not slip, and will relieve the pressure of the metal against the teeth.

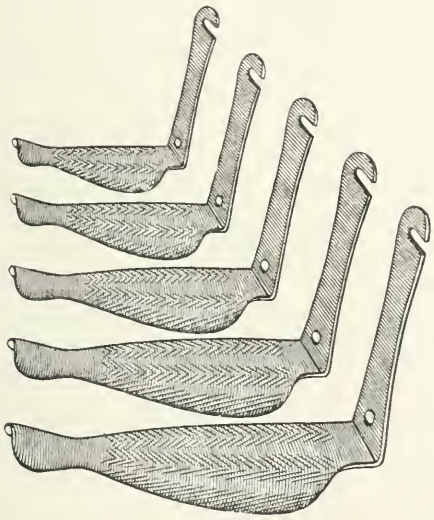


Fig. 18.
Experimental spatula.

The tongue I have bruised many times, by following the advice to pull the tongue out of the mouth at the beginning of the introduction of the spatula. This can be overcome by crowding the tongue back into the mouth and placing a roll of gauze between the under surface of the tongue and the inner aspect of the teeth of the lower jaw. I do not pull the tongue forward at all now, alas it finds its way forward too many times. Haematoma and lacerations may develop at the tip, which so far

have amounted to nothing except the soreness and inconvenience. They usually subside within ten days.

Before removing the instrument from the mouth, the secretions accumulated in the cavity of the hard palate and in the naso-pharynx, should be removed by the suction apparatus. If not, when the head is replaced on the table top, the fluid will flow back into the anaesthetized larynx and may upset the patient considerably by choking.

A part of the work done under or by the aid of the suspension laryngoscope can also be done by either the indirect method with mirror, etc., or by the aid of one of the direct spatula or tubes now in use. If one had to sum up in one word the value of suspension-laryngoscopy, I should say *accuracy*. It is quite true that pedunculated tumors of the vocal cords can, have been and are being removed by the mirror and forceps, but the procedure is a tearing one every time. You surely cannot compare this with the accuracy that accompanies the procedure of picking up the tumor mass with a pair of forceps and dissecting it free from its base with a knife or scissors.

Papilloma have been removed time and again through a straight tube or spatula, but they always recur, and one is tired long before the larynx is clear, and the papilloma have recurred almost before the instruments are clean, and yet I will report fourteen cases removed by dissection, each in one sitting, and none have recurred to this time. St. Clair Thompson reported his brilliant result of the removal of an intrinsic malignant growth from the larynx. The operation was a "tearing" one, as described by him. I will have four to report to you, of removal by dissection wide of the growth, with no recurrence up to this time—the oldest being nearly two years.

Cauterizations of the larynx for tuberculosis, that can not be done except by the most skilled, can be done far more accurately and with less pain by one not so skilled, aided by suspension.

I have destroyed two rather large squamous celled epithilioma involving the hypo-pharyngeal wall near the mouth of the esosophagus, by the "Percy" method of cautery, the cases are now free from return and the surfaces cicatrized. This would have been perfectly impossible unaided by suspension.

Intubations can be done, foreign bodies removed, abscesses opened and radium accurately placed and maintained. Parts can be inspected that have never before been seen, namely, the under surface of the vocal cords and the ventricles of the larynx, by the use of my "Tilting Mirror." Finally, stitches can be placed in any part under view and all operative work be carried on in a thoroughly surgical and scientific manner, as one practices upon the skin surface. The work is at all times in perfect full view of the operator and he is free to be as accurate as possible in every move, sitting comfortably with both hands free, not even a tired muscle-strained assistant to worry about.

In reviewing my work with the suspension laryngoscope and the dissecting instruments I am struck forcibly by three facts: 1. The ease of acquiring the technique—in fact one has acquired the technique during his hospital life, and that of his early general surgery. 2. By the absolute accuracy and deliberation with which one works, having both time to think and act without the fear of losing the field, as occurs in indirect and direct methods. 3. The very mild amount of reaction that occurs after what would seem the most unwarranted abuse of such a structure as the larynx.

In proceeding with the surgery of intrinsic growths, one may prepare to work in this way: The patient is suspended and is perfectly quiet and comfortable, or as near so as possible, under either local or general anaesthesia. The larynx and anterior commissure of the vocal cords are in full view, all parts are fixed and the field well lighted, either by head mirror. Klar, Kirstein attachable or detachable electric lights. The larynx is tested with a cotton mop of 10% cocaine, and if slight reflex occurs, the mucous membrane of the *larynx only* is painted until all local sensation is gone. In some cases it will be possible to inject by my extension syringe, cocaine or novococaine into the tissues of the larynx for anaesthesia. Once anaesthetized, the surface is painted or scrubbed gently with argyrol solution, 20%, or pure alcohol, that it be rendered as nearly clean surgically as possible.

Vocal nodules are picked up carefully and examined to be sure that nothing but nodule is in the forceps, when the small tumor is carefully cut from its base.

Pedunculated tumors are treated likewise, their point of attachment being sought, and it is striking how many grow from the loose area just under the vocal cord instead of from the vocal cord itself as appears upon indirect examination. Here the cord is lifted up or turned back so that the attachment can be seen and the tumor removed with its base included, the raw surface remaining being either covered with the compound tincture of benzoin as a dressing, or stitched as was done in one case by me, where the raw surface was unusually large.

In papilloma I have found my greatest pleasure in the fact of being able to remove them completely at one sitting, without recurrence. Some of my cases are over a year old and have not recurred as yet, and are still under observation.

Papilloma of the larynx differ in no way from those on the skin or other mucous membrane surfaces, why should they recur so persistently in this locality as against all others? It would seem the only answer is, incomplete removal. Why should this be? Because we have never before been able to operate with anything but punching or pinching forceps, neither of which will remove completely a papilloma from its base.

I have now fourteen cases to my credit with no recurrence in any. The first case, operated on in July, 1913, is still free from his papilloma, has a very good voice, is perfectly well. I referred to him as "Buster" in the article before the American L. R. and O. Society, June 19, 1914. The case referred to in the same article as "D. B." has an interesting history. After the removal by dissection in August, 1913, she returned home, and remained well until February, 1915, when she returned again to the clinic with some hoarseness. I was sure, upon hearing her voice, that now I must tabulate my first failure, when upon examination I found that there was a small papilloma developed beneath each vocal cord. I remembered that no papilloma was found beneath the vocal cord at the operation at all, and in looking into the larynx the parts above the cords were perfectly free while just beneath the cord these two small weak looking masses appeared. I removed them by dissection, and she has since had no return of any kind.

For papilloma I proceeded by picking up the growth with a hook or mouse tooth forceps, planted as near the base as possible and dissect cleanly well beneath the growth, taking care not to injure muscle tissue so as not to limit the function if possible. After dissecting clean all the involved surface, the base is scraped thoroughly with a spoon curette and the raw surface left swabbed with pure alcohol.

I have never given arsenic or used radium or any other agent to retard the growth, depending first on my dissection, and secondly I was anxious to be sure that the lack of return was due to nothing else but clean dissection.

I have removed four malignant intrinsic growths of the larynx, one spindle cell, the other squamous cell epithelioma. My first case referred to at Atlantic City meeting as "Mr. B.," is still free from and resemblance of return, is hard at work and enjoying good health.

"Joe C.," colored, was operated on by my method in June, 1914, tumor occupying the anterior half of the right vocal cord, extending to the commissure. He is a professional singer in a negro vaudeville, and weighs about 197 pounds. With suspension under local anaesthesia I removed by dissection down to the cartilage, the anterior third of the left vocal cord, the right cord back to its vocal process, and the tissue for about one-half inch on the cricoid below the vocal cords. His recovery was very rapid and complete, and he now has a moderately fair voice (not singing) and is so far without recurrence.

"Mr. H.," operated on in January, 1915, and "Mr. T.," in March, 1915, are too recent, except to say they have both healed nicely and are at this minute healthy and well (April 20, 1915).

The cases of malignancy of the larynx suitable for this procedure must be carefully selected. The tumor must be purely intrinsic. If the joint has been fixed for some time and the history that of a fairly rapid growth, I would hesitate, if the arytenoid is edematous and one fears a progression here, or if it would seem to extend subglottically to the crico-thyroid membrane, or if cervical glands are palpable, then I would not select this method.

All four cases were practically well on the fourth day after

the operation, there being no temperature or any symptoms that gave the least amount of concern. In none has there been the slightest disposition of edema or of stenosis at any time, and I am still surprised at the practical absence of inflammatory reaction accompanying these cases. I believe the possibilities of recurrence are lessened here, because of the fairly sterile field under which healing takes place, with no external wound or separation of the thyroid or cricoid cartilage. It has been through this pathway that my thyrotomy cases have recurred. I have not had a sufficient number, nor sufficient time to formulate anything that would be more than a mere personal thought.

I have destroyed by the actual cautery two squamous celled cancers growing from the mouth of the oesophagus, both tumors occurring in men of about 70 years of age, one a negro, the other a white man. In one, the tumor involved the posterior surface of the arytenoid, and was beginning to go down the oesophagus. Under suspension, with the mouth wide open and a current of air playing in the mouth and the suction carrying off the smoke, and assistant's hand on the surface of the neck guarding the temperature through the skin, I proceeded to burn through the growth in all directions, after the method of Percy, being careful that the temperature was not sufficient to char the tissues, but enough to turn them to an ashy white. The sitting required about fifty-five minutes. The patients went through their convalescence nicely and are still free from recurrence. Both are still under observation and will furnish material for a later report. These cases were done in the early part of December, 1914. I think this is the first reported instance of this method under suspension, and in dealing with tumors this way in this locality. In the case of a pedenculated epithelioma growing from the post pharyngeal wall, just above the arytenoid cartilage in an old negro man of about 68 years, I dissected the tumor free from its attachment well below its base. There was left an open surface of one and one-quarter inches long and about half an inch wide, which I closed nicely by fine cat gut sutures, using the smallest Lane needle and No. 0 plain catgut. This was done in November, and the patient is still well.

The immobility of the larynx under suspension, renders the

operation of cauterization of tuberculous ulcerations accurate and certain, without danger of destroying healthy tissue. I have operated on four cases of this type with uniform good results, relieving pain, adding to the comfort and prolonging the life of the patients.

I have removed a peanut from the bronchus of a baby fourteen months old, under suspension, with my speculum for separating the vocal cords. I removed a few masses from the trachea, and a large part of the kernel impacted in the right bronchus. It required no anaesthetic nor a tube for this work.

Suspension was used in the removal of an open safety pin from the oesophagus of an eleven-months-old child. The clasp, imbedded point upwards behind the cricoid cartilage was caught with one pair of the baby forceps, the spring end with another and the pin rotated so as to lie with its point downward towards the stomach, changing hold, the forceps from the clasp end, now caught the point side of the shank, and bent it in so as not to catch the side wall. The spring end was then brought up and out, with the point guided by the other forceps so as not to injure the wall of the oesophagus. The child recovered nicely.

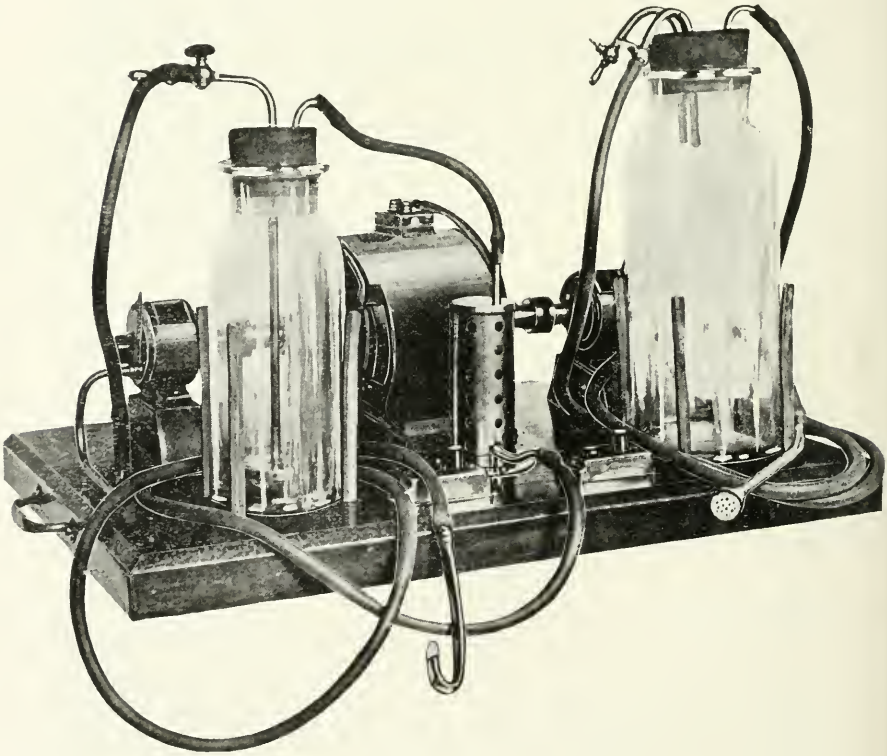
A young boy who received a blow on the side of the neck, suffered a fracture of the thyroid cartilage. I saw him some weeks after, with aphonia, dyspnoea and a palpable fracture. Under suspension I was able to see a large granulation protruding into the larynx from the side of the fracture. Both cords were movable, but very red. I removed the granulation and placed an intubation tube in the larynx to fix the fractured plate. This was worn for about six days. Upon its removal, the crepitus previously felt in the cartilage was gone. He breathes well, but is still aphonic.

Laryngology was born when Garcia discovered the laryngoscope, it bowed slowly to Kirstein when he saw directly into the larynx with his spatula, and it is now bowing again to our master of laryngology, Prof. Gustave Killian, when we are able to sit and view the larynx under suspension with both hands free to work.

While we all realize the infancy of the procedure, and are groping widely for its advantages and limitations, one can not

but think that the *old* must give way to the *new* method of attack, and I am certain that we will begin to change our views, in proportion to the field of view and the possibility of its accomplishments.

I submit to you this, "A review of my efforts to place the apparatus, its principles and accomplishments, upon a firm foundation, a procedure established, true, but requiring much work yet, to give it its proper status in our scientific attainment."



(*Candidate's Thesis.*)

TUBERCULOSIS OF THE LARYNX WITH SPECIAL REFERENCE TO THE USE OF TUBERCULIN.

BY HILL HASTINGS, M.D.

During the past ten years in Southern California I have had the opportunity to observe a large number of cases of tuberculosis of the upper respiratory tract and to follow up some tuberculin-treated patients for a considerable length of time. It is hoped that the clinical observations of tuberculosis of the larynx here reported may be of some little value, and that some encouragement may be given to the careful use of tuberculin.

Laryngologists have a better opportunity of watching tuberculous lesions than any other workers in medicine. But, and I hope it is not presumptious to say so, our observations are of very little value unless we are able to follow up cases for some time in a good tuberculosis sanatorium. For that reason resident physicians in sanatoria should become proficient in laryngological examination. If they took as active an interest in the lesions of the larynx, as they do in the lesions of the lungs, the observations that would accumulate would be of greater value than at present.

GENERAL CONSIDERATIONS.

Tuberculosis of the larynx is essentially a chronic localized lesion, the result of an infection (and possibly always an autoinfection) of tubercle bacilli; chronic because a certain resistance has already been established.[1] In fact the active pulmonary lesion, which is generally considered the primary focus from which the lesion higher up is caused, is now considered by many

(I am indebted to the service in the County Hospital; the Clinic of the Los Angeles Medical Dept., University of California; and especially to the service of the Barlow Sanatorium for tuberculous patients.)

[1]Koch's original experiment (1891) showed that tuberculous guinea pigs, when reinoculated, behaved differently from healthy guinea pigs in that the lesion from reinoculation was less active than from a similar inoculation in a control guinea pig, either healed or tended towards healing, without peri-glandular involvement.

to be secondary to a focus that has been dormant for years, likely since childhood. ([2] and [3]). Many observations support this view.

Tuberculosis of the larynx is rarely if ever primary. The primary focus may be undemonstrable except by autopsy. In view of the numerous positive tuberculin test observations[4] and confirmatory autopsy records in apparently non-tuberculous patients a diagnosis of *primary* tuberculosis of the larynx can well be questioned. Certainly a verdict of "not proven", so far as its being *primary* is legitimate, until a searching autopsy is made. From numerous animal experiments, prompted by Koch's original experiment, as well as from close clinical observations, we must look upon a tuberculous lesion of the upper respiratory tract as a new lesion in a patient who has been previously infected and who has acquired a certain degree of immunity. ([5] and [6].)

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[2]-[3]Hammond and Wolman, of Johns Hopkins, "Tuberculin in Diagnosis and Treatment." "Von Behring found it was impossible to produce pulmonary phthisis in guinea pigs with a single injection of tubercle bacilli, but that repeated injections frequently cause characteristic chronic lesions of the lungs. From these experimental studies Von Behring drew parallel conclusions for man, announcing that pulmonary tuberculosis could develop only in a previously infected individual. With keen insight he placed the date of infection in early childhood."

[3]Hamberger in 1907 reports 484 autopsies in children; in 617 of the 848 tuberculosis was not the cause of death, yet 103 of the 617 (17%) showed incidental tuberculosis. Many of these later would develop pulmonary tuberculosis.

[4]Beck, quoted by Hammon and Wolman, made a tuberculin test on 2,505 patients, 1891 to 1897, in the Institute of Infectious Diseases in Berlin: "36 were definitely tuberculous, and all reacted; 338 cases were suspected tuberculosis, and 86.8% reacted; 1,746 patients gave no clinical evidence of tuberculosis, yet 819, or 47.9% reacted."

[5]For example, E. R. Baldwin ("Hypersusceptibility to Tuberculin in Tuberculosis," Yale Med. Journal—Feb., 1909) quotes experiments made in 1892 by Trudeau—"Animals were made hypersusceptible by inoculations of bird tubercle bacilli and later infected in the eye. Immediately violent reaction followed and the eyes seemed to be doomed. On the contrary they gradually cleared up and healed, while those of control animals, which showed no immediate reaction to the inoculations, gradually became destroyed by caseation."

[6]"It is now an accepted fact that tuberculosis confers an immunity as general and as easily demonstrable as do most infectious diseases." Hammon & Wolman, 1912.

There is in the secondary lesions a healing tendency, or at the worst, a certain combativeness that makes the lesion chronic and to a greater or less extent non-destructive, even though the pulmonary condition does not improve. That the mortality in cases of tuberculosis of the lungs with laryngeal involvement is high does not invalidate this statement. Such cases progress to a fatal termination irrespective of the laryngeal lesion, and often with that lesion non-progressive, as we all have frequently seen. A hopeless view is not truly correct, at least so far as the lesion in the larynx, pharynx, or ear is concerned.

THE FREQUENCY OF TUBERCULOSIS OF THE LARYNX.

In Southern California, for obvious reasons, there are probably more cases of tuberculosis, in proportion to the population, than in any other section of the country with the exception of Colorado or Arizona; and for that reason a higher percentage of tuberculosis of the larynx is seen in a general practice of ear, nose and throat. My case records of tuberculosis of the larynx number 99, in 4719 ear, nose and throat patients, or 2.1%. That two in every one hundred patients that come to one's office have tuberculosis of the larynx seems rather high. It is likely above the normal This percentage would be increased if bed-ridden cases seen at the County Hospital, and elsewhere, were added. In the ear, nose and throat clinic, Los Angeles Medical Dept., University of California, in 14042 cases, there were 108 cases of tuberculosis of the larynx (.7%), in the past four years.

In the Barlow Sanatorium there were 38 cases of tuberculosis of the larynx in 743 cases of tuberculosis—5.1%. This percentage is remarkably low (20% to 30% being that more commonly reported) and it is due to the fact that patients with laryngeal tuberculosis are excluded, as much as possible, from that Institution.

In the County Hospital where there is the largest number of tuberculous cases the records are too incomplete to be of statistical value.

As to primary tuberculosis of the larynx, I have never seen a case. Occasionally patients with tuberculosis of the larynx and more frequently patients with tuberculosis of the ear, are

seen who have been unaware of any tuberculous condition of the lungs and often with negative reports from physicians; but invariably careful examination, or re-examination, by competent chest men, has shown tuberulosis of the lungs, sometimes inactive, often active.

A point worth noting is the absence of tuberculosis of the larynx in children.[7] I have never seen a case in a child. Tuberculosis of the ear, however, is not so infrequent. The absence of the laryngeal involvement in children is to a certain extent explainable by the fact that tuberculosis in children is less often of the lungs, and more often of the intestines, joints, meninges, glands, etc., and when of the lungs it runs a more rapid course, of the acute miliary character.

An interesting point is the occurrence of tuberculosis of the larynx in patients who have been treated with tuberculin. Bandelier and Ropke claim "That they have seen no new tuberculous laryngitis develop in patients that are treated by tuberculin." (Hammon and Wolman, "Tuberculin in Diagnosis and Treatment".) The latter's comment is "that it is true that the complication occurs with comparative rarity in tuberculin patients." On this point I wish to record 2 cases where this did occur. *One case*—E. G. H., age 24, Barlow Sanatorium, Sept., 1909, developed typical tuberculous lesions of the epiglottis and vocal band and inter-arytenoid fold. He had been given tuberculin for a year before entering the Sanatorium and to the extent of getting decided reactions. It is worth noting here that this patient subsequently recovered—case reported later. *Another case*—Mrs. Q.—Barlow Sanatorium, developed laryngeal tuberculosis April, 1913, while taking tuberculin in the Sanatorium. She had had tuberculin for over a year. The laryngeal involvement, however, was inactive; was a mound-shaped infiltration of the inter-arytenoid fold that did not ulcerate.

Whether or not immunity to the laryngeal complication occurs in tuberculin-treated patients is of great interest and importance;

[7]Dworetzky—(Annals of O. R. & L.—December, 1914) calls attention to this fact and says in 100 children with tuberculosis, treated in the Otisville (N. Y.) Sanatorium, he did not find a single case of laryngeal tuberculosis.

and these cases are reported not so much to controvert the point as to induce others to report their observations.

Our experience has been that commonly noted in regard to the occurrence of tuberculosis of the larynx, that most of the laryngeal cases are 2nd or 3rd stage pulmonary cases with considerable sputum. There have been notable exceptions; some that make one believe that infection of the larynx occurs not from sputum, but from infection by the lymph or blood stream. (In tuberculosis of the ear this has been even more often our observation.) In one case, F. K., No. 398, Barlow Sanatorium, June, 1914, the pulmonary lesion, although of the 2nd stage, was not very active; frequent examinations of the small amount of sputum raised, were negative for t.b. and only once a few found; the patient had no fever; the general condition was excellent and there was no pain or soreness, only hoarseness. The laryngeal tuberculosis was that of a third stage case; great infiltration of the epiglottis, followed by considerable ulceration; marked infiltration with œdema of both arytenoids, the right one immobile; both vocal cords irregularly infiltrated.

A similar case—Miss S.—moderately advanced, 2nd stage, both upper lobes without cavity, with very little sputum at any time (in 2 years' observation) and never any tubercle bacilli found; had extensive involvement of the larynx and ulceration in pharynx (2 Wassermanns negative). The lung condition entirely cleared up (in 443 days) and the laryngeal and pharyngeal lesions healed. This case will be reported later.

As to acute catarrhal inflammation being a factor in the etiology of tuberculosis of the larynx, there has been in our experience an absence of any history of attacks of acute catarrhal inflammation as a pre-tubercular stage. In the 3rd stage pulmonary cases where there is much sputum with pus organism, a chronic catarrhal inflammation is often found, as commonly noted. It is plausible that in such cases the resistance of the laryngeal mucous membrane is lowered and invasion by direct contact favored; but in such cases the lowered general resistance, from a losing fight against the pulmonary infection, has seemed to us the factor of paramount importance. The high percentage of laryngeal involvement found at autopsy seems rational to in-

terpret this way.[8] The absence of any acute or even chronic inflammation as a pre-tubercular stage is especially noticeable in tuberculosis of the ear. Almost invariably the Eustachian tube and tympanum in the early stage are dry. In such cases the otoscopic examination gives the appearance indicative of an acute catarrh, whereas examination of the nose and naso-pharynx and Eustachian tube shows them often absolutely normal, the tube being unusually open and dry; the tuberculous infiltration being, for the time being, confined to the drum membrane or the inner tympanic wall without any general involvement of the mucous membrane of the middle ear.

It is not uncommon in reports to read of pathologic conditions of the nose and throat, such as deflected nasal septa, obstructions from polyps, hypertrophies, etc., being factors in the etiology of tuberculosis of the upper air passages, in that frequent attacks of catarrhal inflammation of the ear, pharynx, and larynx, produce a congested and vulnerable membrane, susceptible to entrance of tubercle bacilli. Such had been my teaching and it seemed rational. Experience, with considerable surprise, has not borne out this view. The absence of history of repeated attacks and also the absence of marked catarrhal inflammation, has been surprisingly noteworthy, not only so far as the larynx is concerned but, to a marked degree, so far as the ear is concerned.

The hoarseness so long noted before actual soreness in swallowing calls the patient's attention to his throat, is not infrequently due to the tuberculous infiltration itself. As before noted, in 3rd stage cases, with much sputum, there is frequently an associated catarrhal inflammation of the larynx and also of the trachea, but many such cases do not become tuberculous and there is good ground for questioning even in these cases, whether the catarrhal inflammation itself, while apparently somewhat a factor, is as large an etiologic factor as has been thought. That nasal pathological conditions do increase the prevalence of catarrhal inflammation of the ear, pharynx, and larynx is

[8]Fetterolf (9th Annual Report of the Phipps Institute, Philadelphia, 1915) gives autopsy records of 100 cases dying of pulmonary tuberculosis, in 83 of which laryngeal tuberculosis was found.

not questioned; nor is it disputed that they need correction. The point is that in our experience there has been no notable association of tuberculosis of the upper air passages and marked previous catarrhal conditions.

The 99 personal case records of laryngeal tuberculosis are analyzed, as to parts affected, as follows—

Epiglottis, 32 cases (33%) infiltration alone 14; infiltration with ulceration 18.

Ary-epiglottic folds, 42 cases; infiltration alone 38; infiltration with (demonstrable) ulcer 4.

Arytenoids 51 cases; infiltration alone 37; infiltration with (demonstrable) ulcer 14.

Inter-arytenoid region, 25 cases; infiltration alone 21; infiltration with ulcer 4.

Vocal band, 22 cases; infiltration 11; infiltration with ulcer 11.

Vocal cord, 40 cases; infiltration 25; infiltration with ulcer 15.

It is worth noting that in this series tuberculosis of the pharynx was present in 7 cases; mouth 5 cases; fauces (tonsil or pillars) in 5 cases.

A look at this summary of the 99 cases shows a few interesting things. First—that ulceration was found in a larger percentage in the parts of the larynx covered by thin mucous membrane rather firmly adherent to the underlying cartilage or fibrous tissue. Thus, of the epiglottis there was ulceration in nearly 60% of the cases where that organ was involved; in the vocal band 50%; in the vocal cord 38% showed ulceration. Markedly different is the percentage in other parts of the larynx where there is considerable sub-mucous tissue and a plentiful blood supply. Thus, of the ary-epiglottic folds 42 cases, ulceration was found in 4, less than 10%; of the arytenoids 51 cases, ulceration was found in 14, 27%; of the interarytenoid region 25 cases, ulceration 4, 16%.

Frequently the thought occurs to one that there must be ulcerations that cannot be seen with the laryngoscope, being hid by the infiltration and oedema and by the impossibility of seeing all parts of the larynx. However, Fetterolf's recent report, above referred to, of 100 autopsy cases, makes one believe that ulceration does not occur nearly as often as we had thought, especially of the

parts where the mucous membrane is loosely adherent and with considerable blood supply beneath the mucous membrane. Thus, Fetterolf, in his autopsy report, gives percentages from his autopsy findings remarkably close to the percentages in the above series of clinical findings, as follows—

Aryepiglottic fold, 58 cases, only 9 cases ulceration were found, 15½%.

Arytenoid cartilages, 57 cases, 14 cases with ulceration, 24.5%. (In my series-clinical—51 cases, 14 cases with ulceration.)

Inter-arytenoid space 51 cases, ulceration found in 4, less than 8%. (In my series 25 cases, ulceration in 4.)

On the other hand he found the vocal bands, 42 cases—18 showed ulceration (43%); vocal cords 49 cases, all ulceration except 10 (80%); epiglottis 59 cases, 35 showed ulceration (60%, the same as in my clinical series).

As to pain in tuberculous laryngitis; of the 99 cases, 39 had neither pain nor soreness, 20 had slight (not troublesome) soreness; 40 complained of considerable soreness or pain.

It is often surprising to find so little discomfort and often none, in cases where the epiglottis has "melted away", and where considerable infiltration with oedema, of the aryepiglottic folds exists. The deep infiltration of the arytenoids and interarytenoid folds has been the lesion that caused the most pain, in our experience.

The results of the series of the 38 laryngeal cases at the Barlow Sanatorium (the most accurate I have) are as follows—

Died in the Sanatorium	13
Discharged, improved (pulmonary), laryngeal lesion—active and advanced—died later	12
Discharged, improved (pulmonary) and died later—laryngeal lesion small and not active	4
Discharged, improved (pulmonary and laryngeal)	3
Discharged, pulmonary arrested, laryngeal arrested	3
Discharged, pulmonary arrested, laryngeal lesion healed	2
Still under observation	1
	38

In 25 of the 38 cases the laryngeal lesion was progressive. In 13 of the 38 cases the laryngeal lesion was not progressive, but was either apparently healing, arrested, or healed.

TUBERCULIN THERAPY.

A great revival of hope in the cure of tuberculosis followed Koch's discovery of tuberculin (1891). The disappointing reaction that followed its use is well known. The bad effects from large doses caused a reasonable prejudice against tuberculin. The failure to obtain any abrupt improvement in pulmonary tuberculosis from small doses of tuberculin caused general skepticism. Extravagant claims have made most of us discredit favorable reports and deterred many of us from giving tuberculin therapy in small doses a fair trial. During the last decade more and more favorable reports from tuberculin in small doses have been made by cautious observers not only in the treatment of pulmonary tuberculosis but also of tuberculous lesions outside of the lungs. There is an overwhelming concensus of opinion that tuberculin in large doses is apt to do harm.

As to pulmonary tuberculosis—the opinion of two of our best, and most conservative, authorities may be accepted as indicative of the general feeling at this time. Trudeau ("The Therapeutic Use of Tuberculin", Am. Journal Med. Sciences, 1906) sums up his statistical paper as follows—"Many years ago, in spite of the general denunciation of tuberculin, I had formed the opinion that tuberculin, when carefully administered, had within certain limits a favorable influence on the course of the disease, and that the results of Sanatorium treatment could be improved and made permnaent in many cases by its application. As years have passed I have seen no reason to change this opinion." Baldwin ("Hypersusceptibility to Tuberculin in Tuberculosis"—Yale Med Journal, Feb., 1909,) states—"In pulmonary tuberculosis, at least, I feel inclined to select tuberculin immunization as the goal for treatment. The superficial tuberculoses—lupus—laryngeal and intestinal ulcerations appear as arrested bacilli that produce lesions at the place of entrance into the body." The literature is full of reports on tuberculin therapy. Most of the reports are of cases of pulmonary tuberculosis; but many of late are cases of tuberculosis of other organs that have done well under tuberculin therapy. For example, in general surgery, R. T. Morris ("Non-operative (tuberculin) Treatment of Tuberculous Glands of the

Neck."—N. Y. Medical Journal, Oct. 3, 1914,) advocates the use of tuberculin, combined with iodoform in oil injections. Morris states—"One fact, however, is significant, that previous to 10 years ago I operated many times in the course of a year for removal of tuberculosis glands of the neck, but during the past ten years I have not operated once."

Noteworthy is the report of Hawes and Floyd (Boston Med. & Surg. Journal, Jan. 6, 1910,) of 25 cases of tuberculosis of the eye, referred from the Mass. Eye & Ear Infirmary, under the observation of Dr. George S. Derby, in which the cures are attributed to tuberculin. C. N. Spratt (Journal-Lancet XXXII, 1912) reports 7 cases, treated by tuberculin, 4 cured, 2 improved and 1 under treatment.

As to tuberculin in tuberculosis of the larynx, much depends upon the pulmonary condition. It is unfortunate that in the majority of cases tuberculosis of the larynx occurs in patients whose general resistance is very low by reason of a long and losing fight against pulmonary tuberculosis. The advanced pulmonary lesion, to a great extent hinders the application of tuberculin to the secondary lesion. Focal reactions in a badly diseased lung might well be dangerous to life, while in the larynx, for example, the reaction might not be harmful and, in fact, might prove helpful. Trudeau says, however, that marked improvement has suddenly occurred in patients in the third stage in whom tuberculin has been used.

In the series of 99 private cases above reported it seems impossible to make any comparison that would be at all accurate, between the tuberculin-treated patients and those not treated by tuberculin. Aside from the inevitable incompleteness of many case records, there is one serious objection to any conclusion that might be drawn, namely, that tuberculin-treated patients are usually selected patients, selected because by their satisfactory lung condition they have demonstrated a certain resistance to tuberculosis.

It seems better to report the tuberculin-treated cases in which the records were the most reliable and complete. With one exception the following cases are from the Barlow Sanatorium

and the tuberculin, of course, was administered by the resident physician.*

Case 1.—S., April 15, 1909; aged 23; lungs; stage 3; far advanced. Larynx; stage 1—infiltration inter-arytenoid and v. c.; no ulcer; not very active. Hoarseness; slight soreness on coughing. Time of observation 645 days. Tuberculin began May 2, 1910: .00001 mgm.; 27 doses given in 148 days, up to October 10, 1910; max. dose 0.5 mgm. Laryngeal lesion May 4, 1910; remained as 1 year before; did not progress. October 10, 1910, larynx better, less of the nodular swelling of the cord. Result: Lung condition not improved; larynx improved.

Case 2. H., September 28, 1909; aged 26; lungs; stage 3; moderately advanced; sputum positive. Larynx; stage 3; moderately advanced. Ulceration of epiglottis and of right vocal band, with moderate infiltration; infiltration with superficial ulceration of interarytenoid fold. Soreness on swallowing and hoarseness (6 mos.). Time of observation 552 days. Tuberculin began: dose 0.00001 mgm. (B. F.*) November 8, 1909, continued to October 31, 1910, 53 doses in 357 days; max. dose 2.1 mgm. Within four months decided improvement in the larynx was seen; the ulceration had cleared up, the granulation surface more smooth and evident healing taking place. In six weeks more, April 12, 1910, the ulcers were healed. The lung condition cleared up gradually. *Result:* Discharged, lung condition arrested; larynx healed. Two years later, April 30, 1912, was apparently entirely well; in active business life in San Francisco. This patient had taken large doses of tuberculin before he came to the sanatorium, for seven months; tuberculin O. T. up to 20 mgm. and got decided reactions. *Remarks:* In this case there was considerable ulceration of the epiglottis, the ulcer being about 1 cm. in diameter. There was a ragged ulceration of the upper surface of the vocal band. While the lungs showed 3rd stage, moderately advanced, general condition of the patient was good and he was deemed suitable for tuberculin injections. The larynx condition was also 3rd stage and was of the type that usually progresses. Recovery has apparently been complete.

Case 3. J. R. R.; March 5, 1910; aged 32; lungs, stage 3, moderately advanced. Larynx, stage 2, moderately advanced. Epiglottis and ary-epiglottis folds normal; slight red infiltration of the arytenoid and inter-arytenoid space; ulceration of the right vocal cord, infiltration of both vocal bands without ulceration.

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*I am indebted to Drs. W. Jarvis Barlow, R. L. Cunningham, R. S. Cummings and W. C. Klotz for the notes of the tuberculin cases.

* B. F.—Bouillon filtrate.

No soreness on swallowing. Hoarseness for 6 months. Laryngeal condition of itself not severe, no discomfort. Time of observation 316 days; tuberculin 199 days, 28 doses of B. F., max. dose .9 mgm. Patient died January, 1911, from severe hemorrhage. Larynx lesion was not progressive and at no time was there any discomfort on swallowing. Patient was up and around when severe hemorrhage began.

Case 4. F. S.; May 27, 1912; age 32; lungs, stage 3, moderately advanced. Larynx, stage 3, moderately advanced; destructive ulceration of the epiglottis, infiltration and ulceration of the arytenoids; infiltration of both ary-epiglottic folds with ulceration on the right side of pharynx. Vocal cords and vocal bands not affected. History of pain on swallowing since June, 1912. No history of syphilis; Wassermann examination, negative. Time of observation, 443 days. Treatment: For three months patient progressively grew worse, treated with formalin applications, curettment of ulcers, cleansing treatment and powder of iodoform, orthoform and sterate of zinc. For two months was given protiodid of mercury, ¼ gr., 4 to 5 a day. Tuberculin began September 3, 1912: 0.00001 mgm., and continued to January 3, 1913. October 11 tuberculin was increased from last dose on October 6 of .0006 mgm. to .200 mgm. of B. E.* Patient seen following day, October 12, showed a marked focal reaction of the ulceration of the pharynx and larynx. November 15 .1 mgm. given and marked stick reaction. At this time the symptoms of the throat had all disappeared, ulcers had apparently healed. Tuberculin stopped until December 9; began again with 0.001 mgm. and increased gradually up to .03 mgm., which again produced stick reaction. Before ulceration healed focal reaction occurred after 2 or 3 injections of tuberculin. On October 12 the first focal reaction was rather severe, the swelling around the ulceration was markedly increased; by October 25 swelling had decreased rapidly and the ulcers cleared up markedly. Healing took place rapidly after this. She had no other treatment after tuberculin was begun. Patient was discharged from the sanatorium, lung lesions arrested and larynx apparently healed. April 27, 1915: Have seen patient frequently during the last two years; has remained entirely well both as to lungs and throat. She is busily occupied as a nurse. *Remarks:* The mercury was given in this case despite two negative Wassermann reactions, on the bare chance of there being mixed infection and the ulcerations possibly being specific. It did not look specific to any of the laryngologists who saw the case. The mercury was not pushed and it was stopped because it was apparently doing no good.

*Bacillen Emulsion.

Case 5. Mrs. Q.: March 27, 1913; age 29. Lungs, 3rd stage, moderately advanced. Larynx, stage 1, incipient. Infiltration of the inter-arytenoid region developed one year after admission to the sanatorium, during all of which time tuberculin was being given. Infiltration was mound-shaped, firm in appearance and did not ulcerate. Hoarseness developed, but no soreness or pain; slight interference with movement of the arytenoids. Time of observation 1,005 days. Tuberculin was given for 389 days, 78 doses, up to 2 mgm. B. F. Comp.* Focal reaction noticed after .6 mgm. After injection of 2 mgm. had both focal and general reaction. This dose was repeated and again a focal and general reaction. A normal salt solution injection was given (for purpose of control) and no reaction. Another injection of .2 mgm. was then given and marked focal reaction in the larynx appeared; all tuberculin was then stopped. Patient was discharged, lung condition improved, general condition apparently excellent, laryngeal lesion much smaller and not troublesome. April, 1915, patient has been active and well since discharged from sanatorium; no return of trouble in the larynx. *Remarks:* This was one of the cases reported elsewhere in the paper where laryngeal lesion developed during the giving of tuberculin. It was an inactive lesion and grew smaller under subsequent treatment.

Case 6. W. H. A.; August 24, 1914; age 34. Lungs, 3rd stage, moderately advanced. Larynx-epiglottis showed infiltration with ulceration ½ cm. in diameter. Arytenoids, slight infiltration; pain worse at night, hoarseness. Time of observation, 183 days. Tuberculin, B. F. Comp., for 146 days, 38 doses; .01 mgm. max. dose. Had focal reaction larynx after .008 mgm. Discharged February, 1915; lung condition improved; general condition good; laryngeal lesions improved, but not entirely well; no pain or soreness.

Case 7. Mrs. A., September 10, 1914, age 39. Lung condition moderately advanced, stage 2. Laryngeal condition, stage 2, partially healed. Laryngeal lesion dates back four and one-half years; developed ulceration left vocal cord in 1910, in Colorado. At that time being treated by Dr. Gerald Webb, Colorado Springs, for pulmonary tuberculosis. Diagnosis of laryngeal lesions made by Dr. Frank L. Dennis. Was treated at that time for five months with tuberculin. Hoarseness and soreness in the beginning, but grew better. One and a half years ago soreness again developed and hoarseness has been worse. Laryngeal condition: epiglottis, arytenoids, ary-epiglottic folds normal; lesion confined to vocal cords; right vocal cord infiltrated, pale red, not ulcerated. L. v. c. shows loss of substance, posterior 1/3 (at seat of former

*B. F. Compound: Bacillen Emulsion, 2 parts; bouillon filtrate, 5 parts.

ulcer); no ulceration is now apparent; gives the appearance of ulceration in the past that has healed. L. cord somewhat lame. L. arytenoid, while apparently not infiltrated, is slightly impaired in its movements.

Tuberculin begun (Dr. Walter Barlow) (September 10, 1914): .0000001 mgm. B. F., increased up to 1 mgm. January 15, 1915; increased again up to 10 mgm. by February 8, 1915; this dose repeated four times. Had 39 injections during the six months. General condition has remained good; no loss in weight; no temperature over 99.9; lung condition quiescent; fibroid in character. Hoarseness has grown markedly less, soreness less. Infiltration right cord decreased markedly; color almost back to normal. *Remarks:* In this case the laryngeal lesion dates back over five years. Ulceration of the left v. c., which was present at that time, apparently healed and has remained healed. Infiltration right cord, which was not present at that time, but developed since, has been an inactive lesion and has almost, if not altogether, subsided. There has not been sufficient time elapsed as yet, to pronounce the case well.

Case 8. F. K., June 4, 1914. Lung condition moderately advanced, 3rd stage. Laryngeal condition moderately advanced, 3rd stage. Epiglottis shows ulceration with considerable destruction, left half epiglottis almost destroyed; right half shows a round, swollen stump, infiltration with oedema. The ulcerated left half has healed in places. Both arytenoids infiltrated, right one markedly so; right arytenoid almost immobile, as is also right cord. Both v. c. infiltrated irregularly, thick and red. Little or no soreness in spite of the extensive laryngeal lesion. Hoarseness dates back six months. General condition excellent; appetite good; eats normal amount of food without any trouble. No history of syphilis; Wassermann reaction, negative. Tuberculin begun August 28, 1914, with .005 mgm. B. F. Comp.; rapid increase without any reaction either general or focal, without any rise of temperature. (Same tuberculin used on other cases in the sanatorium has given the normal reaction). The unusual tolerance to tuberculin induced further increase of dose. In December, 1914, took 220 mgm. of tuberculin without any reaction, focal or general (10 mgm. is usually the max. dose for focal reaction). Skin reaction (tuberculin) quickly positive. Second Wassermann reaction was negative. *Remarks:* This patient is still under treatment. No further extension of the laryngeal lesion, but no marked improvement; no discomfort. Lung condition is satisfactory; small amount of sputum, only occasional bacilli. It is too early to give the effects of tuberculin in this case. Case is reported because

of the quiescent character of a lesion that looks active and troublesome and also because of a marked tolerance to tuberculin.

Conclusion.

As to tuberculin, it should be said that experience with tuberculin-treated cases is yet too small, and the results too much clouded by the effects of other remedial agents to enable any one to make positive statements as to its efficacy. However, one cannot help but be prejudiced favorably by the results as shown in the Barlow Sanatorium cases. Of the eight patients with laryngeal tuberculosis, treated with tuberculin, five are living, two have been healed for over two years; two are classed as "Improved," lesions quiescent (inactive infiltration), and not troublesome, both at work; and one case is still under treatment, lesion not troublesome, general condition excellent. Three of the eight cases are dead. One (Case 3) died of hemorrhages; the laryngeal lesion was not progressive and was not troublesome. The second case had infiltration of the v. c. and inter-arytenoid space, was observed for 1½ years, did not ulcerate, became smaller and was never troublesome. The third case showed no change under tuberculin. Thus in the three dead cases the laryngeal lesion did not play an important part. While these cases were selected cases so far as the general condition was concerned they were all second or third stage (pulmonary) cases, with marked laryngeal involvement (in 2 cases with considerable ulceration).

In several cases not observed during the tuberculin treatment, but the healed laryngeal lesions seen, the same favorable impression was created, as in the Barlow cases. But it is deemed best to report only those cases that were directly under our observation for a considerable period of time, and where the amounts of tuberculin and number of doses were known, and the progress of the disease watched. A personal belief in the efficacy of tuberculin has thus resulted.

It is felt that tuberculin-treated cases should be reported that in time we may be able to judge more correctly the value of tuberculin therapy. The good results deserve reporting, for they at least lighten somewhat the gloom that overshadows our hopes in treating tuberculosis of the larynx.

(*Candidates thesis*)

THE RADICAL TREATMENT OF PERITONSILLAR ABSCESS BY TONSILLECTOMY DURING THE ACUTE STAGE OF THE DISEASE.

BY HARRY A. BARNES, M.D.

Peritonsillar abscess is a suppurative inflamation of the walls of the sinus tonsillaris. As the tonsil itself is in reality only a complicated mucous membrane containing a large amount of lymphoid tissue and covering the walls of the sinus, quinsy may be considered a submucous abscess of the sinus. The pus, therefore, usually is confined between the fibrous mucosa of the sinus (the tonsillar capsule) and the muscular walls of the fauces immediately subjacent to it—the superior constrictor of the pharynx externally, and the palato-glossus and palato-pharyngeus anteriorly and posteriorly, respectively. The pus may be confined by inflammatory adhesions to a small area anywhere within this comparatively wide field; or it may dissect the capsule away from the muscles over a large portion of the sinus. As the sinus extends high into the palate, the latter type of abscess appears to be palatal in position, and may be opened and drained either through an incision in the palate, or one extending upward and outward through the superior wall of the supratonsillar fossa. Anterior and posterior abscesses, when their situation can readily be determined, are usually easily accessible by incision through the anterior pillar or between the posterior pillar and the tonsil. When, however, the pus is confined to the space between the body of the tonsil and the superior constrictor muscle, the task of reaching it by incision is not always an easy one. Every surgeon has probably had the experience of repeated failures to locate the pus in this class of case, which of all surgical affections is one of the most uncomfortable with which we have to deal. Some years ago Ballanger suggested a method by which such abscesses might readily and surely be drained with a minimum of suffering to the patient—a capsular dissection of the tonsil backward until the abscess cavity is reached. Provided

ankylosis of the jaw, nearly always present in quinsy, is not so great as to make access to the fauces difficult, this method is easily carried out and is practically sure of success. I had been using it for some time with satisfactory results, under a general ether anesthesia, when Dr. A. Coolidge, Chief of the Throat Department of the Massachusetts General Hospital, suggested that the operation might be carried a step farther, and the tonsil then and there be dissected out completely. I confess that I was at first somewhat startled by the idea, having the old preconceived notions of the dangers of creating so large a wound in the presence of an acute streptococcus infection. On second thought, however, I concluded that our fears on this score were not only groundless, but were without a good theoretical basis. Subsequent experience has, I think, confirmed this.

The theoretical dangers of the operation are two:—first, that a general anesthesia is not safe on account of the possibility of subsequent pulmonary infection from inspired pus; second, that it is always dangerous to operate on an acute inflammation of the tonsil, at least to do so extensive an operation as a tonsillectomy, because of the fresh field opened up for infection. On the first head I can only say that I do not believe that the danger exists, beyond that which may be present in the dissection of any tonsil, provided due care is taken when the abscess cavity is reached, to prevent with gauze sponges any escape of pus below the fauces. Very large peritonsillar abscesses are not suitable for this method of treatment, both because they may easily be drained by simple incision, and because their size makes a general anesthetic inadvisable. In these the large amount of pus might be difficult to manage in such a manner as to be sure that a considerable amount did not get below the fauces. In the smaller deep-seated abscesses a sponge on the end of a holder absorbs the pus perfectly as fast as it is evacuated. I have now operated on ten cases by this method, and in none have I had reason to believe at the time of operation that any pus was inhaled, nor has there been anything in the subsequent history of these cases that would suggest it.

Of the second danger, that of infecting a large fresh wound

with the streptococcus, it may be said that both theory and observation show that this method is much safer than the usual treatment by simple incision. This incision through the palate or the anterior pillar *does* open a fresh field for infection, in that in some of its course at least it goes through more or less normal tissue, where inflammatory exudate has had no chance to place a protective barrier between the streptococcus and the general system. To this also may be added the possibility of opening one of the large veins of the sinus walls by a blind incision. A fatal case of general streptococcus infection following such an incision, occurred at the Massachusetts General Hospital last year; which I have always felt might have been due to this cause. Moreover, a fresh cut immediately closes more or less completely, so that drainage is poor, not only from the abscess cavity itself, but from the newly infected area of the incision. When the tonsil is dissected out, however, the conditions are in every way more favorable. The sinus walls are everywhere protected from absorption of the streptococcus by marked inflammatory infiltration, and the only fresh wounds made by the dissection are those through the plica anteriorly and posteriorly. It may be argued that the sinus walls everywhere are liable to injury; but if the dissection is carried out according to the description given later in this paper, there is but slight danger of this. Add to these theoretical considerations the fact that after dissection we have, instead of a closed abscess sac and a poorly drained fresh incision, a simple open ulcer the walls of which are everywhere rendered practically impervious to absorption, and it will be appreciated that this radical treatment is far less dangerous from the standpoint of streptococcus infection than the older method of simple incision.

One other point makes this method of particular value—the abscess may be treated with success much earlier than in any other way. Peritonsillar abscess has been said not to become suppurative until the fourth or fifth day of the disease. That this is not so, anyone may convince himself by dissecting out the tonsil on the third or even the second day. He will then find that the disease becomes suppurative early, and that the

reason that pus is seldom found before the fourth day is that it is too deeply seated and too small in amount to be found with any degree of certainty by the method of incision. Tonsillectomy offers a practical way of safely cutting short these most distressing inflammations early in their course. It is advisable that it be done not earlier than the third day, however, as before that time the walls of the sinus are not sufficiently infiltrated to offer a suitable defense against streptococcus infection.

The operation of tonsillectomy in these cases differs only slightly from the usual procedure by the dissection method. It is essential that the dissection be a clean one, and that the muscular walls of the sinus be as little injured as possible. If one of the larger veins is opened, it seems to me that the chances of general streptococcus infection may be distinctly increased. To avoid this, it is necessary that the field of dissection should be seen at every step. Now these tonsils are always tightly adherent to the walls of the sinus, except over the area occupied by the abscess itself. It is difficult, therefore, to find the line of demarkation between the two after the first incision in the plica has been made. The usual more or less blind evulsion of the superior lobe by blunt instruments or by probe pointed knives is dangerous, as the sinus walls are almost sure to be injured. To insure against this, I have found a pillar retractor essential. The one I have used is not unlike Killian's retractor for the lacrimal sac, except that the handle is longer, the blade broader and thinner and the curve somewhat greater. After the first incision in the plica has been made, the retractor is inserted by an assistant under the free edge, and the plica and pillar gently pulled outward and forward. At the same time the tenaculum holding the tonsil is pulled inward, so that the line of demarkation between the capsule and the sinus wall is easily discerned at the apex of the resultant V-shaped cleft between the two tissues. The lightest touch of a sharp knife serves to deepen and widen this cleft, which is in this manner extended backward until the abscess cavity is reached. A gauze sponge on a holder is then inserted against the incision and the abscess cavity allowed gradually to empty itself. If there is a large amount of pus,

several sponges may be required to absorb it. This, however, causes no embarrassment, as the stream may be cut off or turned on at will by the valve-like action of the plica and anterior pillar controlled by the retractor. When the pus has been completely evacuated, the dissection is again carried on as before until the tonsil is sufficiently freed to allow of the easy application of the snare.

The bleeding during this operation is surprisingly slight—no greater, indeed, than which occurs in the usual operation on the non-adherent tonsil.

The question of the disposition of the other tonsil is a delicate one. I have always removed it; and though cogent reasons undoubtedly might be advanced against it, I have yet to see any untoward results that would lead me to change my belief in its safety.

The results of the operation are particularly gratifying, especially to the patient. All the local symptoms subside with surprising rapidity, so that on the day following operation the sore throat of tonsillectomy alone remains. Strangely enough, this last symptom is always quite mild on the side of the abscess, and patients invariably remark upon the fact. The lessened sensibility of the wound is probably due to the infiltrated condition of the tissues.

PRESENTATION OF INSTRUMENTS.

Dr. Otto T. Freer, Chicago: In applying solutions to the trachea I have found that in using the intratracheal syringe, even with finest lateral holes to squirt from, the fluid flows in quantity down the trachea having little effect on its upper part and running into the bronchi, where it may cause prolonged reaction if it be irritating. For this reason I have always preferred the intratracheal spray tube, devised by me in 1903, to the syringe. The use of this older tube implied its passage into the trachea between the vocal cords before spraying. This passage, however, was difficult of performance and was a trauma which irritated the larynx. I present, therefore, a new tube for intratracheal spraying constructed for me by Dr. De Vilbiss. He has so made it that it instantly responds with a full spray to the air pressure, so that it does not need to be passed down between the cords, being merely held just above them, an abundant, coarse spray entering the trachea through the open glottis before the cords have time to close, as they do when irritated by the puff of air that precedes the spray from the average atomizer.

I show also the pernasal spray tube devised by Dr. De Vilbiss, which seems to be little known. This long, slender tube may be passed along the nasal floor into the nasopharynx where direct applications may be made to the mucous membrane and to the Eustachain orifices. The spray is coarse and free, so that it will serve also for cleansing purposes.

Obituary

MOREAU ROBERTS BROWN, M.D.

Dr. Moreau Roberts Brown died, after a protracted illness, at his home, Winnetka, Ill., March 14, 1914.

Dr. Brown, born in Galveston, Texas, July 26, 1853, was the son of James Moreau and Rebecca Ashton (Stoddart) Brown. He was educated in the private schools of his native place and at the Chester, Pa., Academy. His medical education was gained at the Jefferson Medical College, Philadelphia, and in the Medical Department of the University at Louisville, Ky., where he received the degree of M.D. in 1876. He then entered upon the practice of medicine at Galveston, where he established an extensive clientele. He became a member of the Galveston Medical Society, was house physician to the Galveston City Hospital, County physician to Galveston County, and Quarantine Physician and City Physician of Galveston from 1876 to 1879. In 1877 he was appointed Surgeon to the Washington Guards and Galveston Artillery. In the epidemic of Yellow Fever in 1879 he made a lasting reputation by the masterly way in which he barred the epidemic from Texas, threatened with an invasion of it from Louisiana. In 1881, at the conclusion of his term as Quarantine officer of Galveston, he abandoned general practice and entered the Department of Laryngology and Rhinology, studying for several years at Göttingen, Munich, Vienna and London, in which last named place he enjoyed the instruction and the friendship of Sir Morell Mackenzie. At the close of his foreign studies he returned to Galveston, but in 1886 removed to Chicago. Here he soon established himself in his specialty. For many years he was Professor of Laryngology, Rhinology and Otology in the Chicago College of Physicians and Sur-

geons, resigning in 1902 and accepting the same chair in the Chicago Polyclinic. His clinical associations were with the dispensaries and hospitals of the above named institutions. For nearly twenty years he served as Medical Director of the National Union Insurance Organization.

He was a member of The American Medical Association, The American Laryngological Association, The American Climatological Association, The Illinois State Medical Society, The Chicago Medical Society, The Chicago Medico-Legal Society, The Chicago Practitioners' Club, The Chicago Laryngological Society and The Medical Examiners' Societies.

In 1876 he was married to Miss Alice J. Doherty, who a few years later died. In 1887 he married Miss Louise G. Grevemberg,, of Jeanerette, La., who, with a son, Dr. James Moreau Brown, and a daughter, Miss Rebecca Brown, survive him.

Dr. Brown's reputation, both as physician, gentleman and friend, was an enviable one. Possessed of a peculiarly genial nature he was held in universal affection and respect.

JOSEPH SCRIBNER GIBB, M.D.

Dr. Joseph Scribner Gibb, of Philadelphia, was stricken with apoplexy near Philadelphia and died shortly afterwards, on November 2, 1914.

Dr. Gibb was born in Philadelphia on February 11, 1859, and graduated from the medical department of the University of Pennsylvania in 1880, serving as a resident physician at the Philadelphia Hospital and then taking up the practice of general medicine. In the early 90's he began the practice of laryngology and otology, to which he devoted himself exclusively during the latter years of his life. He was a member of the College of Physicians of Philadelphia, and at the meetings of the Section on Laryngology and Otology his papers were always welcomed by the Fellows and listened to with attention. He had served, at one time, as chairman of the Section, during which period his enthusiastic labors resulted in the addition of much valuable material to its scientific works.

Dr. Gibb was a member of the American Laryngological Association and attended its meetings, at many of which he read valuable contributions.

In addition to his professional ability and skill, his kindly personality and thorough honesty of purpose endeared him to his patients as well as to his professional colleagues. Although towards the end of his life he suffered from serious impairment of health, he continued his labors both in private practice and in his hospital connection. For many years he had filled the position of laryngologist to the Episcopal Hospital of Philadelphia, and he performed the duties of that position until the time when he was unable to attend to them with that degree of faithfulness which he had exacted from himself throughout his career. His life, both professional and private, was a conspicuous example of devotion and self-sacrifice. F. R. P.

SAMUEL WOOD LANGMAID, M.D.

Dr. Samuel Wood Langmaid died in Brookline, Mass., February 3, 1915, in his seventy-eighth year, closing a medical career which covered a period of half a century.

The son of Samuel H. Langmaid and Dorcas Sawyer, his wife, he was born in Boston, Mass., June 26, 1837. The story of his pedigree is particularly interesting.

The Langmaids were of Welsh extraction, the name having originally been spelled "Llangmaede" or "Llangmaedd." His great grandfather came, with his wife, from Wales and settled in Lee, N. H. His grandfather, Winthrop Langmaid, married a Scotch wife. Dr. Langmaid's maternal grandfather, Edmund Sawyer, came of a family whose names, almost without exception, date back to the original English settlers of Massachusetts. Thus, the Bartletts, the Emerys, the Kelleys and the Knights came from Romsey, England, in 1635 and settled in Newbury, Mass., as did his ancestor, William Sawyer. The Websters came from Ipswick, England, in 1635 to Ipswick, Mass. The ancestry of his maternal grandmother was equally good, including as it did such names as Whittier,

Morrill and Clement, all of whom came from England between 1632 and 1638, while of those who came later all were English. Without exception they settled in Massachusetts. Some of them later removing to New Hampshire.

From the above it will appear that few of any race have ever had a purer lineage.

Dr. Langmaid was born in the city of Boston, but his parents soon removed to Roxbury, whence they again moved to Cambridge at the time the boy entered college, for which he was prepared at the Roxbury Latin School. In 1859 he graduated from Harvard College and from the Lawrence Scientific School, with the Degree of A.B. The year of graduating he taught for a few months at the Henderson Institute, in Danville, Ky., but, deciding to study medicine, he entered the Harvard Medical School, completing his course as surgical house officer at the Massachusetts General Hospital and graduating in 1864 with the degrees of A.M. and M.D.

In June, 1864, he volunteered, and became acting assistant surgeon in the United States Army. He was at first ordered to White House Landing, Va., but the next month was sent to the hospital at Readville, Mass., where he served until the closing of the hospital a year later. After a few months in Europe he began general practice in Boston on Park Square. He was on the surgical staff of the Carney Hospital from 1868 to 1880. In 1866 the Children's Hospital was founded and he became one of the surgeons, serving until after the new building on Huntington Avenue was opened in 1882. He then gave up general surgery and established a department for diseases of the throat, of which he had charge for many years.

When Dr. Langmaid began practice the specialty of laryngology was slowly developing in Europe. On account of his own voice and his association with singers, he followed with interest everything connected with the larynx, and became one of the pioneers of the specialty in this country. He joined the American Laryngological Association in 1880, two years after its foundation, and was president in 1891, the Association meeting in Boston. In 1881 he was appointed assistant

physician for diseases of the throat in Dr. Knight's clinic at the Massachusetts General Hospital, and took charge of this clinic for six months in every year until 1892, when he resigned. He became a member of the American Climatological Association in 1887, and was vice-president in 1901. He was a member of the Massachusetts Medical Society, and of other medical societies and clubs in Boston.

His private practice became more and more limited to the upper respiratory tract, and after about 1880 he gradually withdrew from other work, acquiring many patients from the musical and theatrical professions, and often being consulted by visiting singers and actors. He occasionally contributed to the literature of the larynx, publishing three papers in the old "Archives of Laryngology," which in 1880 started its career. These were on "The Application of the Principles of Vocal Culture," on "The Singing Voice," and "A Common Form of Vocal Disability." He later published a dozen or more other articles, which are listed in the "Transactions of the American Laryngological Association" for 1898 and 1908. During the later years of his life his health became poor, and he finally retired from practice in 1912.

As has been well said of him by his friend Dr. Algernon Coolidge, Dr. Langmaid did much for vocal music in Boston. He had a beautiful tenor voice and took every opportunity to promote good singing. While in college he sang in the college chapel and was leader of the Glee Club. So irrepressible was his music that he was once summoned before the authorities for singing as he walked through the yard. In the course of his life he became a member of many musical associations, the Chickering Club, the Parker Club, the Boylston Club, and later the Apollo Club and the Cecilia. Of his various interests, perhaps the one nearest to his heart outside of medicine was the Harvard Musical Association, of which he was president for many years. He was also a director of the New England Conservatory of Music. For a quarter of a century he sang tenor in the quartet at Trinity Church, before the establishment of the vested choir. He had a large acquaintance, not only among the musical people of Boston, but also among

the noted singers of the world, several of whom were at times his patients.

His interests and his friendships were not confined to medical and musical circles. As a boy he spent his summer vacations in New Hampshire, and acquired a true sportsman's love for the woods, and for hunting and fishing. In later life whenever he had the opportunity he went off with his dogs into the country, or with his rod to some trout stream. He thoroughly enjoyed the life in the open, and the intelligence of his dog, and the fine art of fishing. But equally he sought the society of his fellow men and was a particularly sociable and congenial companion." He was a charter member of the Tavern Club and for some time a member of the Saint Botolph Club.

Dr. Langmaid married in 1870 Miss Ella M. Tuttle, and had two daughters, Miss Bertha Langmaid and Mrs. Conrad Hobbs. Mrs. Langmaid and both daughters survive him.

His chosen friends, from among the very best and most genial of his native city, "remember him for his forcefulness, his keen social instincts, his powers of description and conversation, just as they respect him for his scientific knowledge and his professional skill. A good thing indeed for all Boston to count among its true assets the recollection of this man who was physician, maker of music and of friends, minister to the real good of our lives, both spiritual and physical."

CLINTON WAGNER, M.D.

The death at Geneva, Switzerland, upon November 25, 1914, of our Honorary Fellow, Dr. Clinton Wagner, late of New York, removed a man of no ordinary distinction, the story of whose career is replete with incident, achievement and inspiration.

Born in the city of Baltimore, in 1837, his family were among the earliest settlers of Maryland, for in 1667 his ancestor, Basil Wagner, a native of Germany, received a grant of land from the Crown in the province of Frederick, afterwards Carroll County.

ARMY OF THE POTOMAC
MEDICAL DEPARTMENT
FIELD HOSPITALS
FIFTH CORPS
THE DIVISION FIELD HOSPITALS OF THE FIFTH CORPS WERE ESTABLISHED JULY 2ND AT THE WEIKERT HOUSE AND OTHER HOUSES NEAR LITTLE ROUND TOP AND ALONG THE TANEYTOWN ROAD DURING THE NIGHT THEY WERE REMOVED ACROSS ROCK CREEK AND LOCATED AS FOLLOWS 1ST DIVISION SOUTH OF WHITE RUN ON THE FISCEL FARM 2ND DIVISION 100 RODS SOUTH OF WHITE RUN NEAR THE CLAPSADDLE HOUSE 3RD DIVISION ONE HALF MILE WEST OF TWO TAVERNS AND NEAR THE PIKE THESE HOSPITALS CARED FOR 1400 WOUNDED AND REMAINED IN OPERATION UNTIL AUGUST 2ND 1863
MEDICAL DIRECTOR 5TH CORPS SURGEON JOHN J. MILHAU U. S. ARMY
1ST DIVISION SURGEON EDWARD SHIPPEN U. S. VOLUNTEERS
2ND DIVISION ASSISTANT SURGEON CLINTON WAGNER U. S. ARMY
3RD DIVISION SURGEON LOUIS W. READ U. S VOLUNTEERS
MEDICAL OFFICER IN CHARGE OF THE CORPS HOSPITALS
SURGEON A. M. CLARK U. S. VOLUNTEERS

His mother, of a Welsh family named Peters, was born in Baltimore in 1806.

Clinton Wagner studied at St. James' College, Hagerstown, Md. He entered upon the study of medicine under Dr. Miltenberger, in Baltimore, receiving the degree of M.D. in 1858. Desiring to become a member of the medical corps of the U. S. Army, he presented himself before a board of examiners, of which Dr. William M. Hammond was chairman. Of twenty-eight applicants, but three passed. Of these, young Wagner stood first. He was at once ordered to Fort Leavenworth, Kas. Later, he was transferred to Fort San Antonio, Tex. He was at this place when the war broke out, and his command was captured by the Confederates. On parole, he was sent to New York on the Steamer Indianola. Three Southern born officers were dropped at the Dry Tortugas (Fortress Jefferson). Two of them resigned, and escaping to the mainland, joined the Conferedate Army. Dr. Wagner remained loyal to the Union, and his superior qualities having again attracted the attention of Dr. Hammond, who meanwhile had become Surgeon General of the U. S. Army, he was given a position of much responsibility. After several promotions, he became medical director of the Regular, or Second Division, Fifth Corps, Army of Potomac, and was finally brevetted to the rank of Lieutenant Colonel. He established numerous field hospitals, and on the Mississippi River organized the first floating hospital in Western waters. He was many times at the front, often during the progress of severe engagements, in the course of which he risked great personal peril. One of the most notable incidents of this kind was his experience at the battle of Gettysburg, where he established a field hospital near Little Round Top, the site of which is now marked by a monument bearing the following inscription:

"Army of the Potomac
Medical Department
Field Hospitals
Fifth Corps"

The Division Field Hospitals of the Fifth Corps were established July 2 at the Weikert house and other houses near Little Round Top and along the Taneytown Road. During the night they were removed across Rock Creek and located as follows:

1st Division, south of White Run at the Fiscal farm. 2nd Division, 100 rods south of White Run, near the Clapsaddle house. 3rd Division, one-half mile west of Two Taverns and near the Pike.

These hospitals cared for 1,400 wounded and remained in operation until August 2, 1863.

Medical Director, Fifth Corps, Surgeon John J. Milhau, U. S. Army; 1st Division Surgeon, Edward Shippen, U. S. Volunteers; 2nd Division Assistant Surgeon, Clinton Wagner, U. S. Army; 3rd Division Surgeon, Louis W. Read, U. S. Volunteers; Medical officer in charge of the Corps Hospitals, Surgeon A. M. Clark, U. S. Volunteers."

As is well known, the neighborhood of Little Round Top saw the fiercest fighting of the battle, in the midst of which these field hospitals became so exposed as to make their hasty removal necessary.

At the close of the war Dr. Wagner continued in the Medical Corps of the Army, meanwhile seeing active service at Boise City, Ida., and at Vancouver Barracks, Washington Territory.

The universal testimony of his associates is to the effect that his military career was distinguished for conspicuous bravery, rare surgical skill and marked executive ability.

In 1869 he resigned from the Army and went abroad, spending two years in Vienna, Berlin and London, in the study of Laryngology, and becoming acquainted with the most distinguished masters of the art. Returning home, he established himself in New York as a specialist in his chosen department. It was not long before his brilliant qualities attracted attention, and he was quickly recognized as a teacher, as well as a practitioner, of distinguished ability.

He established the Metropolitan Throat Hospital and Dispensary, a model institution, which rivalled the best clinics of its kind abroad, and soon became famous among students

desiring advanced instruction in Laryngology and Rhinology. He showed great inventive genius, devising many new instruments and surgical methods. His great experience as a general surgeon and his extraordinary technical skill enabled him to attempt with success major operations upon the throat and neck which few specialists were in the habit of undertaking. He was the best master of thyrotomy of his time and his technique in this operation, described in an admirable thesis, has never been surpassed. In a pioneer thesis in 1882, he called attention to mouth breathing in its relation to medicine. His other contributions were numerous and highly valuable. In 1882 he was among the first to enter upon the organization of the New York Post-Graduate Medical School and Hospital, and was its first Professor in Laryngology and Rhinology.

Undoubtedly the most important achievement of Dr. Wagner's professional career was in quite another direction, namely, the founding of the New York Laryngological Society. The story of this may best be told in his own words.

"Forty years ago (1913) the number of men in New York City who were familiar with the methods of examining the throat and nose could easily be counted. Most of us had received practical or clinical instruction in London, Paris, Vienna, or Berlin, but our knowledge was limited and we had no blazed trail to follow through the intricacies of this department of medicine. A number of us met one evening at my house, in October, 1873, and decided to organize a society, not only for mutual improvement and advancement and the enlargement of our limited knowledge of diseases of the nose and throat, but also with the view of establishing on a solid footing with the medical profession at large the specialty of Laryngology and Rhinology in this country, for the reason that many of the physicians at the time looked askant upon all specialties. The general practitioners in medicine and surgery were jealous of interlopers, and probang and gargles were their sole reliance for all cases of sore throat. The nose was ignored. All of us who met on that evening in October were connected with clinics for diseases of the throat. At subse-

quent meetings we sent cases of special or unusual interest, which were examined and discussed by those present, all of whom were young and hard-working, ambitious and determined to make successful careers during the coming years in this, the largest city in America, and destined to become the largest in the world. Not all of them continued to follow the specialty. Those who did, succeeded to the full measure of their expectations, and always stood first among laryngologists. They were George M. Lefferts, Francke H. Bosworth, Morris J. Asch, Woolsey Johnson, and Norman D. Bridge. The two latter died young. The others, Charles McBurney, Robert M. Weir, Matthew D. Mann, Francis P. Kinnicut, saw a broader field for their abilities in surgery or general medicine. But all, before many years had passed, became well known throughout the entire country, and no word of praise from me can add to the lustre of their fame. Many young men came to our clinics for instruction. I had patients from various parts of the country and Canada, but from the Potomac River to the Rio Grande there was absolutely no one to whom I could refer my patients for further treatment at their home towns or cities.

"As an evidence of the rapid growth and popularity of the specialty, within less than five years after the organization of this Society it was deemed advisable to have a National Society. Accordingly the American Laryngological Association was organized at Buffalo, in 1878."

The founding of the New York Society in 1873 marked an epoch in the history of laryngology. Owing in no small measure to the influence of Dr. Wagner, the American Laryngological Association was organized in 1878, but it was not until fifteen years later than the founding of the New York Society that a National Society was established abroad. In 1888 the British Laryngological Association was established by Sir Morell Mackenzie, and several years later other societies began to be organized on the Continent. Now there are few countries which are not thus represented.

In the midst of a brilliant and prosperous professional career Dr. Wagner retired from active practice in New York.

For several years he resided in Colorado Springs and other well known health resorts of the Southwestern part of the United States. Later he spent much time abroad, making practical studies of many popular sanitaria, acquiring an unusually wide and accurate knowledge of Climatology and publishing valuable contributions to its literature.

His associations were always of the best, his circle of friends numbering the most influential and intelligent of those with whom he came in contact. Of untiring energy and indomitable courage, no difficulty seemed to him insurmountable, and no danger, physical or moral, too great to be met and overcome. As a pioneer in American Laryngology he stands in the foremost rank.

Dr. Wagner was married August 28, 1882, to Miss Elizabeth Vaughn, of New York, who survives him.

SECRETARY'S REPORT.

Owing to the appointment of our esteemed fellow, Dr. D. Bryson Delavan as historian and biographer, it is unnecessary that the secretary should dwell at length upon the life histories of those of our fellows who have departed this life.

Since our last meeting we have lost Dr. Clinton Wagner, who last year was appointed an Honorary Fellow of this association.

From our list of Emeritus Fellows we have lost Drs. Joseph W. Gleitsmann and Samuel W. Langmaid, and from our Active Fellowship Drs. Moreau R. Brown and Joseph S. Gibb.

By resignation we have lost from Active Fellowship Dr. James F. McKernon.

This reduction leaves us an Active Fellowship of eighty, to which have been added four new Fellows this year, thus leaving sixteen vacancies to complete the 100 limitation.

There have been no deaths, so far as the secretary knows, of any of the Corresponding Fellows, and there are nine vacancies to be filled.

In our Honorary Fellowship list there are three American and eight foreign vacancies.

An acknowledgment of the receipt of the Articles of Incorporation, Constitution and By-Laws, has been received from all of the Active Fellows, complying with the law concerning the same.

The secretary wishes once more to appeal to those taking part in the discussion to correct and return their typewritten report at their earliest possible convenience.

At the annual meeting of the Council, at the Hotel Manhattan, New York City, Saturday evening, January 9, 1915, the following gentlemen were recommended to the association for admission into Active Fellowship: Dr. Harry A. Barnes, Dr. R. Bishop Canfield, Dr. Hill Hastings and Dr. Robert Clyde Lynch.

The time and place of the subsequent annual meeting was ratified, the selection having been previously made by a com-

mittee consisting of the president and secretary of the association.

There was added to the list of exchanges that of the Stony Wold Sanitorium, over which presides the wife of our former president, Dr. James E. Newcomb.

The second meeting of the Council was held at Niagara Falls, Canada, June 1, 1915.

The resignation of Dr. James F. McKernon was acted upon and it was voted to be accepted with regret.

The further actions of the Council are embodied in its minutes, kept in the official minute book of the secretary.

REPORT OF THE LIBRARIAN.

Your librarian has to report that he has received only three unbound volumes since the last meeting of the association. They are as follows:

Die Neubildungen des Kehlkopfes, der Luftröhre und Hauptbronchien, by Paul Bruns.

Two volumes of the British Medico-Chirurgical Journal.

This great falling off in the receipt of medical literature is probably due to the war.

Respectfully submitted,

J. H. BRYAN, Librarian.

The abstract editor of your Association respectfully presents the following report for the year 1914-1915:

The abstracted proceedings were sent early in June to Dr. H. W. Loeb, who returned 50 galley proofs to your editor for distribution in July, 1914.

These proofs were sent to the medical press with the following letter:

Dear Doctor:

I am sending herewith galley proof of the abstracted proceedings of the last Congress of the American Laryngological Association for publication, if you so desire, in your journal.

These proceedings are abstracted and printed for the Association and simultaneously sent to the medical press.

If you see fit to publish the whole or part, kindly state that it was read before the Association.

Will you please inform me if you wish to receive further copies, as I am preparing a mailing list.

Yours very truly,

The following have expressed a desire to receive these abstracts regularly:

Annals of Otology.
Index of Laryngology.
N. O. Medical and Surgical Journal.
Virginia Medical Semi-Monthly.
Colorado Medicine.
Merck's Archives.
Surgery, Gyn. and Obst.
Vermont Medical Monthly.
Laryngoscope.
W. Virginia Medical Journal.
Old Dominion Journal of Medicine and Surgery.
Pacific Medical Journal.
New York Medical Journal.
Annals of Laryngology.
Journal of Laryngology, etc. (London, England).
Semon's Int. Centralbl. f. Lar. (Berlin).

Respectfully submitted,

EMIL MAYER,
Abstract Editor.

Treasurer's Statement to June 1, 1915.

Receipts.

Balance from old account	$731.06
Dues collected	1,280.15
Sale of Transactions	50.75
Old plates	1.50
Interest on deposits	15.10

Expenses: *Stenographer.*

Stenographer, 1914 meeting	$105.04
Clerical work, proofreading, etc. (secretary)	101.17
Printing Articles of Incorporation	13.50
Transactions, mailing, etc	610.68
Paper, printing, postage, etc. (secretary)	194.47
Flowers, Dr. Gleitsmann's funeral	15.00
Printing, stenographer, etc. (treasurer)	6.62
Collecting checks	2.25
	$1,048.73
By balance in bank	$1,029.83
	$2.078.56

Assets of Association.

Invested.

DeRoaldes Prize Fund	$500.00	
Accrued interest to Feb. 1, 1915	162.93	
		662.93

Current.

Unpaid dues	$60.00	
Bank balance	1,029.83	
		$1,089.83
Total assets		$1,752.76

Liabilities, none.

Respectfully submitted,

J. PAYSON CLARK, Treasurer.

Audited and approved,

Auditing Com. { GEO. STOUT, THOMAS HUBBARD.

June 12, 1915.

EXECUTIVE SESSION.

Held Tuesday, June 2, 1915.
Niagara Falls, U. S. A.

The first action of the Association was the adoption, by section, of the New Articles of Incorporation and Constitution.

There were no proposals for Honorary, Corresponding or Emeritus Fellowships.

There were elected to active fellowship Dr. Harry A. Barnes, Dr. R. Bishop Canfield, Dr. Hill Hastings and Dr. Robert Clyde Lynch.

Dr. Emil Mayer was continued in the position of Abstract Editor for the ensuing year.

Dr. D. Bryson Delavan was again elected official Biographer and Historian of the association.

The reports of the Secretary, Librarian, Treasurer, Auditing Committee, Tonsil Committee, DeRoaldes Prize Fund Committee and the Publication Committee were presented to and accepted by the Association.

All these committees were retained in their respective capacities.

The nominating committee presented the following names to serve as directors for the ensuing year: Drs. G. Hudson Makuen, J. Gordon Wilson, Christian R. Holmes, Harmon Smith, J. Payson Clark, Joseph H. Bryan, George A. Leland, Thomas Hubbard, Alexander W. MacCoy and Herbert S. Birkett, who were elected by the association to serve in this capacity.

At a subsequent meeting of the directors, the following officers were elected:

President—Dr. G. Hudson Makuen, of Philadelphia.

First Vice-President—Dr. J. Gordon Wilson, of Chicago.

Second Vice-President—Dr. Christian R. Holmes, of Cincinnati.

Secretary—Dr. Harmon Smith, of New York.

Treasurer—Dr. J. Payson Clark, of Boston.

Librarian—Dr. J. H. Bryan, of Washington.

Dr. Richardson and Dr. Hubbard formulated a letter to express the regrets of the Association to Dr. Herbert S. Birkett, upon his inability to be present at a meeting held on his native soil.

It was moved and carried that this letter, as read, become a letter of the Association, and be signed by the individual fellows and forwarded to Dr. Birkett. This action was carried out and the Secretary has since received the following letter in answer to the same:

No. 3, Canadian General Hospital,
McGill British Expeditionary Force,
France.

Dr. Harmon Smith, Secretary,
American Laryngological Association,
44 W. 49th Street, New York.

My Dear Harmon Smith:

Here at the front engaged in our humane work, I received your very kind letter, or rather a copy of which was sent to me through my wife, in which the Fellows of the American Laryngological Association have expressed in very kind words their appreciation of what I am endeavoring to do from the humanitarian standpoint in this great war. Words fail me to express how deeply touched I am by this evidence, not only of friendship for me, but of the work which I am endeavoring in my small way to undertake. Please, therefore, at your earliest opportunity, convey to the Fellows my warm appreciation of their splendid letter, and one which I shall treasure for the rest of my life.

I duly note from the circular letter forwarded to me here that you had a very successful meeting at Niagara Falls, Canada, and it was one of the deepest regrets in my mind that I was not there to greet you all on Canadian soil, but you all understand the circumstances why I was not. I very much appreciate the fact and the honor that I have been nominated as a member of the Board of Directors, a position which I have always appreciated. I make note further that our next meeting will be held in Washington on the 9th and 10th of May, and let us hope by

that time this dreadful war will be over and I shall again have the opportunity of meeting the many friends and expressing to them personally my appreciation of their very kind thought of me during my absence at the front.

Kindest regards.

Believe me, Yours very sincerely,

H. S. BIRKETT.

LIST OF ACTIVE FELLOWS.

1916.

1906. Ballenger, William L., Marshall Field Annex Building, Chicago, Ill.
1915. Barnes, Harry Aldrich, 305 Beacon Street, Boston, Mass. Mass.
1908. Barnhill, John F., 408 Penway Building, Indianapolis, Ind.
1904. Berens, T. Passmore, 35 Park Ave., New York.
1893. Birkett, Herbert S., 252 Mountain St., Montreal.
1891. Bryan, Joseph H., 818 17th St., Washington, D. C.
1913. Butler, Ralph, 1926 Chestnut St., Philadelphia, Pa.
1915. Canfield, R. Bishop, Ann Arbor, Mich.
1889. Casselberry, William E., 15 E. Washington St., Chicago.
1896. Chappell, Walter F., 7 East 55th St., New York.
1897. Clark, J. Payson, 71 Marlborough St., Boston, Mass.
1902. Coakley, Cornelius G., 53 West 56th St., New York.
1899. Cobb, Frederic C., 11 Marlborough St., Boston, Mass.
1905. Coffin, Lewis A., 156 West 58th St., New York.
1913. Coffin, Rockwell A., 234 Clarendon St., Boston, Mass.
1893. Coolidge, Algernon, Jr., 613 Beacon St., Boston, Mass.
1913. Dabney, Virginius, 1633 Connecticut Av, Washington, D. C.
1881. Delavan, D. Bryson, 40 East 41st St., New York.
1892. Farlow, John W., 234 Clarendon St., Boston, Mass.
1901. Freeman, Walter J., 1832 Spruce St., Philadelphia, Pa.
1914. Fetterolf, George, 330 South 16th St., Philadelphia, Pa.
1905. Freer, Otto T., 34 Washington St., Chicago, Ill.
1879. French, Thomas R., 150 Joralemon St., Brooklyn, N. Y.
1897. Frothingham, Richard, 616 Madison Ave., New York.
1909. Getchell, Albert C., 6 Linden St., Worcester, Mass.
1913. Goldstein, Max A., 3858 Westminster Pl., St. Louis, Mo.
1898. Goodale, Joseph L., 253 Beacon St., Boston, Mass.

1905. Grayson, Charles P., 251 South 16th St., Philadelphia, Pa.
1906. Greene D. Crosby, Jr., 483 Beacon St., Boston, Mass.
1905. Halsted, Thomas H., 831 University Block, Syracuse, N. Y.
1896. Hardie, T. Melville, 34 Washington St., Chicago, Ill.
1903. Harris, Thomas J., 104 East 40th St., New York.
1878. Hartman, Jacob H., 5 West Franklin St., Baltimore, Md.
1915. Hastings, Hill, 924 Trust & Savings Building, Los Angeles, Cal.
1888. Hinkel, F. Whitehill, 581 Delaware Ave, Buffalo, N. Y.
1907. Holmes, Christian R., 8 East 8th St., Cincinnati, Ohio.
1893. Hope, George B., 159 West 72d St., New York.
1895. Hopkins, Frederick E., 25 Harrison Ave., Springfield, Mass.
1895. Hubbard, Thomas, 541 Nicholas Building, Toledo, O.
1878. Ingals, E. Fletcher, 104 S. Michigan Ave., Chicago, Ill.
1904. Ingersoll, John M., 1021 Prospect Ave., Cleveland, Ohio.
1907. Jackson, Chevalier, 1018 Westinghouse Building, Pittsburgh, Pa.
1878. Johnston, Samuel, 204 West Monument St., Baltimore, Md.
1898. Kyle, D. Braden, 1517 Walnut St., Philadelphia, Pa.
1894. Leland, George A., 354 Commonwealth Ave., Boston, Mass.
1914. Levy, Robert, Metropolitan Building, Denver, Col.
1911. Lockard, Lorenzo B., Metropolitan Building, Denver, Colo.
1913. Loeb,, Hanau W., 537 N. Grand Ave., St. Louis, Mo.
1897. Logan, James E., 1208 Wyandotte St., Kansas City, Mo.
1888. Lowman, John H., 1807 Prospect Ave., S. E., Cleveland, Ohio.
1915. Lynch, Robert Clyde, 634 Maison Blanche Bldg., New Orleans, La.
1896. MacCoy, Alexander W., 216 South 15th St., Philadelphia, Pa.
1914. Mackenty, John E., 43 West 54th Street, New York.
1883. Mackenzie, John N., 605 Washington Place, Baltimore, Md.

1898. Makuen, G. Hudson, 1627 Walnut St., Philadelphia, Pa.
1896. Mayer, Emil, 40 East 41st St., New York.
1913. McKimmie, Oscar A. M., 1330 Massachusetts Ave. N. W., Washington, D. C.
1904. Mosher, Harris P., 828 Beacon St., Boston, Mass.
1914. Munger, Carl E., 81 North Main Street, Waterbury, Conn.
1901. Myles, Robert C., 46 West 38th St., New York.
1903. Packard, Francis R., 304 South 19th St., Philadelphia, Pa.
1906. Pierce, Norval H., 31 Washington St., Chicago, Ill.
1908. Randall, B. Alexander, 1717 Locust St., Philadelphia, Pa.
1903. Renner, W. Scott, 341 Linwood Ave., Buffalo, N. Y.
1897. Rhodes, John Edwin, People's Gas Building, Chicago, Ill.
1884. Rice, Clarence C., 123 East 19th St., New York.
1905. Richards, George L., 84 North Main St., Fall River, Mass.
1902. Richardson, Charles W., 1317 Connecticut Ave., Washington, D. C.
1879. Roe, John O., 44 Clinton Ave., South, Rochester, N. Y.
1913. Roy Dunbar, Grand Opera House, Atlanta, Ga.
1907. Shambaugh, George E., 100 State St., Chicago, Ill.
1909. Shurly, Burt R., 32 Adams Ave., W., Detroit, Mich.
1909. Sluder, Greenfield, 3542 Washington Ave., St. Louis, Mo.
1908. Smith, Harmon, 44 West 49th St., New York.
1911. Stout, George C., 1611 Walnut St., Philadelphia, Pa.
1889. Swain, Henry L., 232 York St., New Haven, Conn.
1903. Theisen, Clement F., 172 Washington Ave., Albany, N. Y.
1892. Thrasher, Allen B., The Groton, 7th and Race Sts., Cincinnati, Ohio.
1892. Wagner, Henry L., 518 Sutter St., San Francisco, Cal.
1892. Watson, Arthur W., 126 South 18th St., Philadelphia, Pa.
1908. Wilson, J. Gordon, 104 S. Michigan Ave., Chicago, Ill.
1906. Winslow, John R., The Latrobe, Charles and Reade Sts., Baltimore, Md.
1905. Wood, George B., 129 South 18th St., Philadelphia, Pa.
1890. Wright, Jonathan, Windy Rock, Pleasantville, N. Y.

Honorary Fellows.

1910. Chiari, Ottokar, Bellariastrasse 12, Vienna, Austria.
1914. Cohen, J. Solis, 1824 Chestnut St., Philadelphia, Pa.
1914. Lastra, De La Sota Y., 7 Calle De Torqueros, Seville, Spain.
1914. Lefferts, George M., Katonah, N. Y.
1910. Massei, F., 4 Piazza Municipio, Naples, Italy.
1910. Moure, E. J., 25 Cours du Jardin Public, Bordeaux, France.
1914. Navratil, Emerich Von, iv Rigyoten, Buda-Pest, Hungary.
1909. Semon, Sir Felix, Rignalls, Great Missenden, Bucks, England.
1914. Thomson, Sir St. Clair, 64 Wimpole St., London, W. England.
1914. *Wagner, Clinton, London, England.

Corresponding Fellows.

1880. Bruns, Paul Von, Tubingen, Wurtemburg, Germany.
1901. Collier, Mayo, 145 Harley St., Cavendish Square, London, W. England.
1893. Desvernine, C. M., Cuba 52, Havana, Cuba.
1901. Grant, Dundas, 18 Cavendish Square, London W., England.
1902. Heymann, Paul, 60 Lutzowstrasse,, Berlin W., Germany.
1908. Killian, Gustav, Lutzow Ufer 3, Berlin W. 10, Germany.
1892. Krause, H., San Remo, Italy.
1902. Lermoyez, Marcel, 20 Rue de la Boetie, Paris, France.
1897. Luc, H., 54 Rue de Varenne, Paris, France.
1903. McBride, P., 20 South Drive, Harrogate, England.
1896. MacDonald, Greville, 85 Harley St., Cavendish Square, London W., England.
1894. MacIntyre, John, 179 Bath St., Glasgow, Scotland.
1896. Mygind, Holger, 31 Havnegade, Copenhagen, Denmark.
1901. Natier, Marcel, 10 Rue de Ballechasse, Paris, 7e., France.
1903. Onodi, A., o'Uctza 12, Buda-Pest, Hungary.

*Deceased.

1910. Rethi, Leopold, IX Garnisongasse 7, Vienna, Austria.
1894. Sajous, C. E., 2043 Walnut St., Philadelphia, Pa.
1896. Schmiegelow, Ernest, 18 Norregade, Copenhagen, Denmark.
1903. Tilley, Herbert, 72 Harley St., Cavendish Square, London W., England.
1901. Wingrave, Wyatt, 11 Devonshire St., Portland Place, London W., England.
1894. Wolfenden, R. Norris, Grimsby, Ontario, Canada.

Emeritus Fellows.

1912. Bosworth, Francke H., 41 Park Ave., New York.
1914. Brown, J. Price, 28 College St., Toronto, Can.
1914. De Blois, Thomas Amory, 48 Gloucester St., Boston, Mass.
*1914. Gleitsmann, Joseph W., 616 Madison Ave., New York.
*1914. Langmaid, Samuel W. 143 Newbury St., Boston, Mass.
1912. Lincoln, William, 210 Lennox Bldg., Cleveland, O.
1914. Porter, William, 3886 Washington Ave., St. Louis, Mo.
1913. Roaldes, Arthur W. De, 634 Maison Blanche Bldg., New Orleans, La.
1914. Robinson, Beverly, 42 West 37th St., New York.

*Deceased.

PAST OFFICERS.

Presidents.

(Year of Election.)

1879.	Louis Elsberg.	1897.	T. R. French.
1880.	J. Solis-Cohen.	1898.	W. E. Casselberry.
1881.	F. I. Knight.	1899.	Samuel Johnston.
1882.	G. M. Lefferts.	1900.	H. L. Swain.
1883.	F. H. Bosworth.	1901.	J. W. Farlow.
1884.	E. L. Shurly.	1902.	J. H. Bryan.
1885.	Harrison Allen.	1903.	J. H. Hartman.
1886.	E. Fletcher Ingals.	1904.	C. C. Rice.
1887.	R. P. Lincoln.	1905.	J. W. Gleitsmann.
1888.	E. C. Morgan.	1906.	A. W. De Roaldes.
1889.	J. N. Mackenzie.	1907.	H. S. Birkett.
1890.	W. C. Glasgow.	1908.	A. Coolidge, Jr.
1891.	S. W. Langmaid.	1909.	J. E. Logan.
1892.	M. J. Asch.	1910.	D. Braden Kyle.
1893.	D. B. Delavan.	1911.	James E. Newcomb.
1894.	J. O. Roe.	1912.	George A. Leland
1895.	W. H. Daly.	1913.	Thomas Hubbard.
1896.	C. H. Knight.	1914.	Alexander W. Mac Coy.

Vice-Presidents.

1879. F. H. Davis.
1880. W. C. Glasgow, J. O. Roe.
1881. E. L. Shurly, W. Porter.
1882. C. Seiler, E. F. Ingals.
1883. S. W. Langmaid, S. Johnston.
1884. J. H. Hartman, W. H. Daly.
1885. H. A. Johnston, G. W. Major.
1886. E. C. Morgan, J. N. Mackenzie.
1887. J. N. Mackenzie, S. W. Langmaid.
1888. W. C. Glasgow, C. E. Sajous.
1889. E. Holden, C. E. Bean.

1890. J. O. Roe, J. H. Hartman.
1891. M. J. Asch, S. Johnston.
1892. S. Johnston, J. C. Mulhall.
1893. J. C. Mulhall, W. E. Casselberry.
1894. C. C. Rice, S. H. Chapman.
1895. J. Wright, A. W. De Roaldes.
1896. T. M. Murray, D. N. Rankin.
1897. A. W. MacCoy, H. S. Birkett.
1898. J. W. Farlow, F. W. Hinkel.
1899. T. A. De Blois, M. R. Brown.
1900. H. L. Wagner, A. A. Bliss.
1901. J. W. Gleitsmann, D. Braden Kyle.
1902. G. A. Leland, T. Melville Hardie.
1903. J. H. Lowman, W. Peyre Porcher.
1904. Thomas Hubbard, W. J. Freeman.
1905. J. L. Goodale, C. W. Richardson.
1906. G. H. Makuen, A. B. Thrasher.
1907 J. P. Clark, J. E. Rhodes.
1908. E. Mayer, F. R. Packard.
1909. C. G. Coakley, H. P. Mosher.
1910. Robert C. Myles, J. M. Ingersoll.
1911. F. C. Cobb,, B. R. Shurly.
1912. A. W. Watson, W. Scott Renner.
1913. F. E. Hopkins, George E. Shambaugh.
1914. Clement F. Theisen, Lewis A. Coffin.

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1879. G. M. Lefferts.
1882. D. B. Delavan.
1889. C. H. Knight.
1895. H. L. Swain.
1900. J. E. Newcomb.
1911. Harmon Smith.

Treasurer.

1912. J. Payson Clark.

Librarians.

1879. F. H. Bosworth.
1883. T. R. French.
1903. J. H. Bryan.

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*1883. Sir Morell Mackenzie, London, England.
*1907. Leopold von Schroetter, Vienna, Austria.
*1904. B. Fraenkel, Berlin, Germany.
*1914. Clinton Wagner, New York.

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*1887. A. Gouguenheim, Paris, France.
*1894. Edgar Holden, Newark, N. J.
*1881. Carlo Labus, Milan, Italy.
*1880. Wilhelm Meyer, Copenhagen, Denmark.
*1901. Moritz Schmidt, Frankfort-a-Main, Germany.
*1881. Pugin Thornton, London, England.
*1881. R. Voltolini, Breslau, Germany.
*1880. W. McNeil Whistler, London, England.
†1881. Sir Felix Semon, Bucks Co., England.
†1887. E. J. Moure, Bordeaux, France.
†1892. F. Massei, Naples, Italy.
†1896. Ottokar Chiari, Vienna, Austria.

Emeritus Fellows.

1914. Thomas Amory De Blois, Boston, Mas.
*1914. Joseph W. Gleitsmann, New York City.
*1912. Charles H. Knight, New York City.
*1914. Samuel W. Langmaid, Boston, Mass.

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*1878. Morris J. Asch, New York.
1895. J. E. Boylan, Cincinnati, Ohio.
*1883. C. W. Chamberlain, Hartford, Conn.

*1882. S. Hartwell Chapman, New Haven, Conn.
1884. J. Solis-Cohen, Philadelphia, Pa.
1880. E. W. Cushing, Boston, Mass.
1878. Ephraim Cutter, West Falmouth, Mass.
*1880. W. H. Daly, Pittsburg, Pa.
*1878. F. H. Davis, Chicago, Ill.
*1901. E. T. Dickerman, Chicago, Ill.
*1878. Frank Donaldson, Baltimore, Md.
*1878. William Carr Glasgow, St. Louis, Mo.
‡1879. Edgar Holden, Newark, N. J.
1882. Franklin H. Hooper, Boston, Mass.
1882. Frank L. Ives, New York City.
*1878. Hosmer A. Johnson, Chicago, Ill.
*1879. Woolsey Johnson, New York City.
1880. William C. Jarvis, New York City.
1879. R. H. Kealhofer, St. Louis, Mo.
*1901. Gordon King, New Orleans, La.
*1885. Charles H. Knight, New York City.
*1878. Rufus P. Lincoln, New York City.
1881. G. W. Major, Montreal, Canada.
1879. Charles McBurney, New York City.
1885. H. Clinton McSherry, Baltimore, Md.
*1881. E. C. Morgan, Washington, D. C.
*1886. J. C. Mulhall, St. Louis, Mo.
1892. T. Morris Murray, Washington, D. C.
*1881. H. Mynter, Buffalo, N. Y.
*1893. James E. Newcomb, New York City.
*1895. J. E. H. Nichols, New York City.
1879. H. K. C. Oliver, Boston, Mass.
1894. William H. Park, New York City.
1892. W. Peyre Porcher, Charleston, S. C.
*1880. D. N. Rankin, Allegheny, Pa.
1881. J. M. Robertson, Detroit, Mich.
1878. Beverly Robinson, New York City.
*1878. T. F. Rumbold, St. Louis, Mo.
‡1880. Charles E. Sajous, Paris, France.
*1879. Carl Seiler, Scranton, Pa.
*1893. Charles M. Shields, Richmond, Va.

1879. Andrew H. Smith, Geneva, N. Y.
1879. Bernhard Tauber, Cincinnati, Ohio.
*1899. Max Thorner, Cincinnati, Ohio.
1888. S. O. Van der Poel, New York City.
*1878. Clinton Wagner, New York City.
1896. Marshall R. Ward, Pittsburg, Pa.
1879. Whitefield Ward, New York City.
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1896. Green V. Woollen, Indianapolis, Ind.
1878. George M. Lefferts, New York City.
1901. Frank Hyatt, Washington, D. C.
*1885. Charles H. Knight, New York City.
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*1893. Arthur Ames Bliss, Philadelphia, Pa.
*1878. E. L. Shurly, Detroit, Mich.
*1892. William Kelly Simpson, New York City.
*1892. Moreau R. Brown, Chicago, Ill.
*1907. Joseph S. Gibb, Philadelphia, Pa.
*1880. Samuel W. Langmaid, Boston, Mass.

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*Deceased. †Corresponding ‡Honorary Fellow.

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